Telephony.

VOLUME VIII. NUMBER 6.

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CHICAGO, DECEMBER, 1904.

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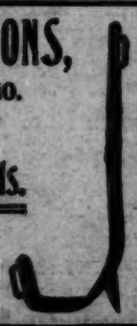

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An Old Friend

Everybody in the telephone business knows the old reliable

Chicago Bridging Generator

Some few new wrinkles have been added for 1905. Look them over

Our 1905 Catalogue is a work of art. Have you a copy of it? If not, please ask us to send one. No charge is made.

Chicago Telephone Supply Co.

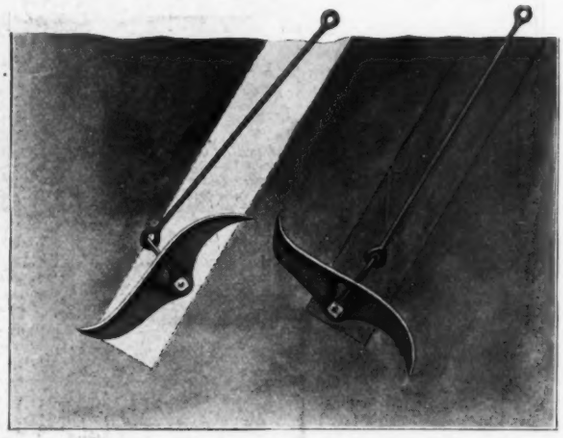
THE GREAT MAIL ORDER FACTORY

NEW YORK ELKHART, INDIANA SAN FRANCISCO

Please tell the Advertiser you saw his Announcement in TELEPHONY.

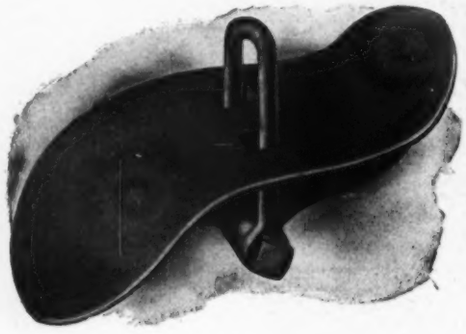
21 Cents worth of this Anchor holds 8,713 pounds, 42 Cents worth holds 10,521 pounds—more than twice the strain resistance of any other method.

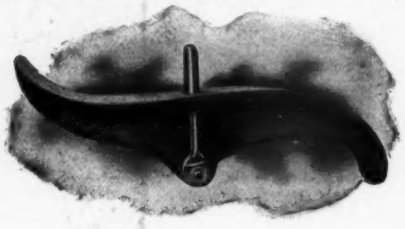
The American Bull-Tongue Anchor



is the scientific and practical method of anchoring poles. Made of cast-iron, heavy, designed to be easily placed into the ground and hold when so placed by the direct strain upon the solid or undisturbed earth. Made without rod—takes any rod—and prices based accordingly.

Method of installation is simple, requiring less effort and time than any other method. Small hole required. Anchor so designed as to place entire strain upon undisturbed earth. Once placed requires no take up in strand, no slipping, no allowance necessary for settling of loose earth. Anchor adjusts itself readily at right angles. Gives over double the strain resistance of any other method without faults of any. Low in price. Last forever, no one part weaker than the whole. Unaffected by rust. Once burried will not give a single inch under maximum strain. Simply dig a hole the small size of anchor, drop in anchor, fill up hole, apply sufficient strain to tighten guy and anchor bear directly upon solid earth. Depth of hole may be varied with corresponding increase of strain. Anchors will hold anything rods or guy will hold.





The "Bull Tongue Pull"

Is about double that of any similar device; it is easier to use and keep on using; costs less to put under ground and service is double; low in cost

TRADE NO.	SIZE OF ANCHOR	SIZE HOLE REQUIRED	STRAIN RESISTANCE BURIED 4 FEET	PRICE EACH	CODE WORD
2500	3 x 8 inches	3 inches	8,712 "	**$0.35**	Ezeankor
2501	4 x 10 "	4 "	10,521 "	**.70**	Ezebury
2502	5 x 12 "	5 "	15,412 "	**1.20**	Ezeprice
2503	6 x 15 "	6 "	16,645 "	**2.50**	Ezelabor
2504	7 x 17 "	7 "	19,380 "	**4.60**	Ezeinstal
2505	8 x 18 "	8 "	21,600 "	**8.00**	Ezehole
2506	10 x 22 "	10 "	33,537 "	**13.50**	Ezedig
2507	12 x 25 "	12 "	45,210 "	**20.00**	Ezer

GENTLEMEN:—The writer, this day, witnessed the testing of the holding power of **a 12-inch American Anchor installed five feet** in the ground near the Campus of our College, a **strain of 60,000 pounds being applied without moving the anchor an inch.** The strain was then increased until the connecting rod broke, the anchor remaining unmoved. We were thus unable to determine how great a power would be required to pull up the anchor. This test was made in the presence of several witnesses immediately after the anchor was installed.

REV. CARL ACKERMANN,
Prof. Mathematics, Lima College.

GENTLEMEN:—We have tried the Anchor made by your company on our pole lines, and have subjected some of them to a very hard strain, and our experience with this Anchor leads us to believe that it is the best on the market, and we have adopted it as our standard in new and all reconstruction work that we may have to do.

Yours truly,
THE LIMA ELECTRIC RY. & LIGHT CO.,
J. A. Bendure, Manager.

The greatest service, the most enduring, most practical, labor saving Anchor at a popular price.

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I. A. BENNETT, Manufacturer, Monadnock Block, CHICAGO

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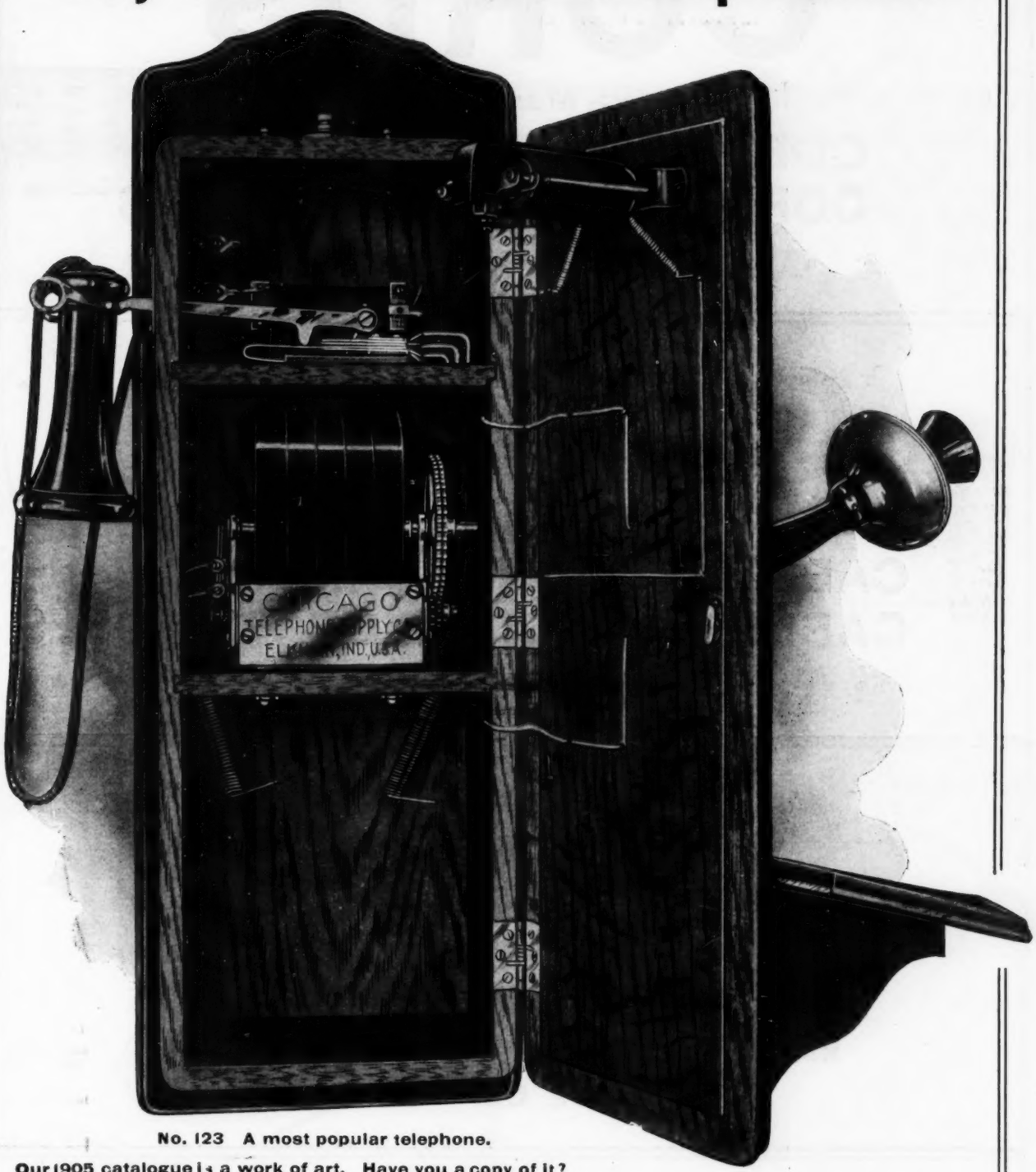
Only the master workmanship endures



No. 123 A most popular telephone.

Our 1905 catalogue is a work of art. Have you a copy of it?
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Chicago Telephone Supply Co.

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CORDS

We Manufacture

CORDS FOR TELEPHONES
CORDS FOR SWITCHBOARDS

Secure Our Prices

CABLES

We Manufacture

CABLES FOR SWITCHBOARDS
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WIRES

We Manufacture

WIRES FOR SWITCHBOARDS

WRITE US CONCERNING OUR NO. 100 SWITCHBOARD CORD

Secure Our Prices

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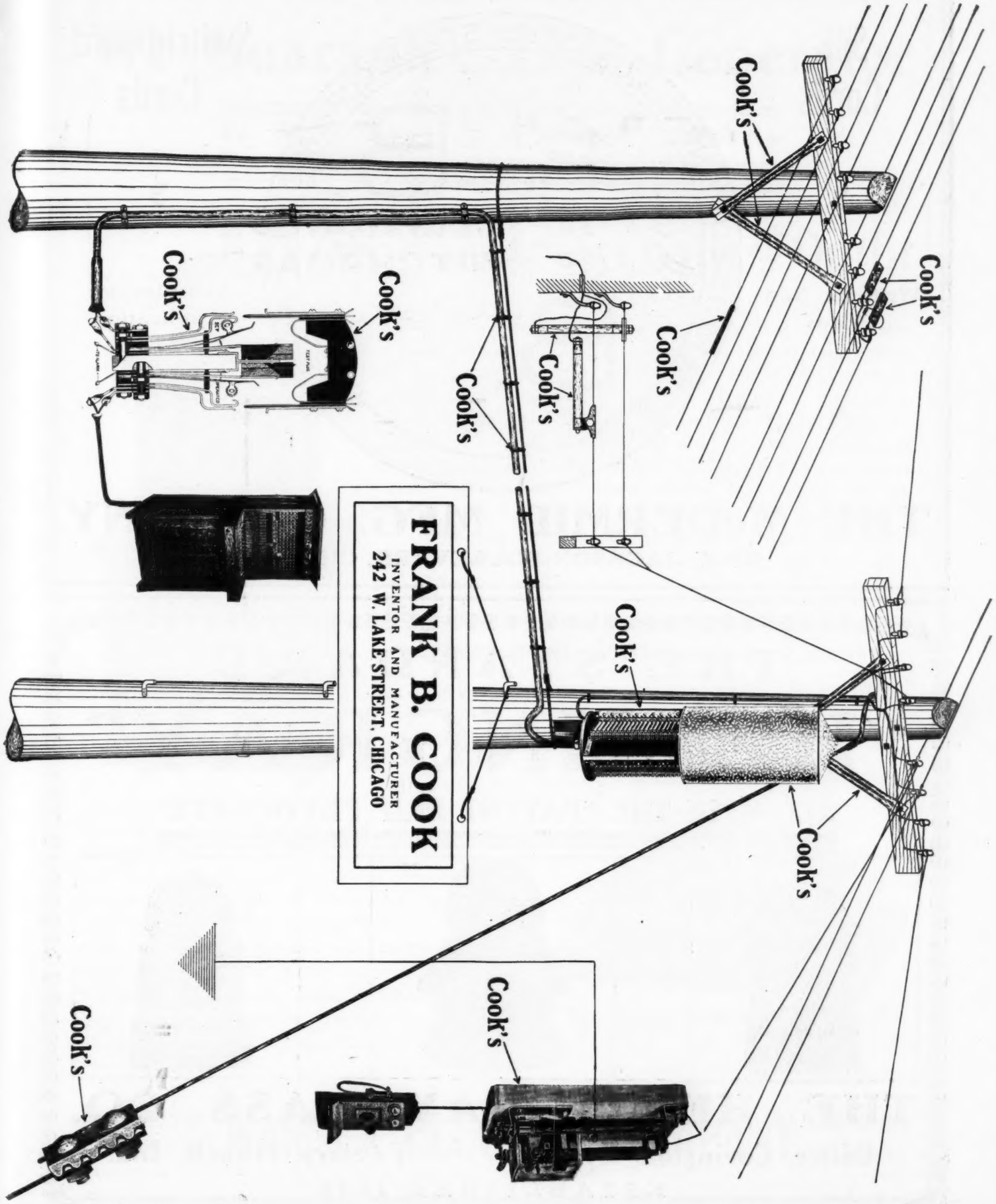

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"THERE IS BUT ONE SUCCESSFUL STEEL CORD AND WE MAKE IT."

P. B. B. M. B. R.

Write for New Prices

Samples on Application

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"HEMINGRAY"

ALL WITH THE "PATENT DRIP PETTICOATS."

THE HEMINGRAY-GLASS CO.

Office, Covington, Ky. Factory, Muncie, Ind.

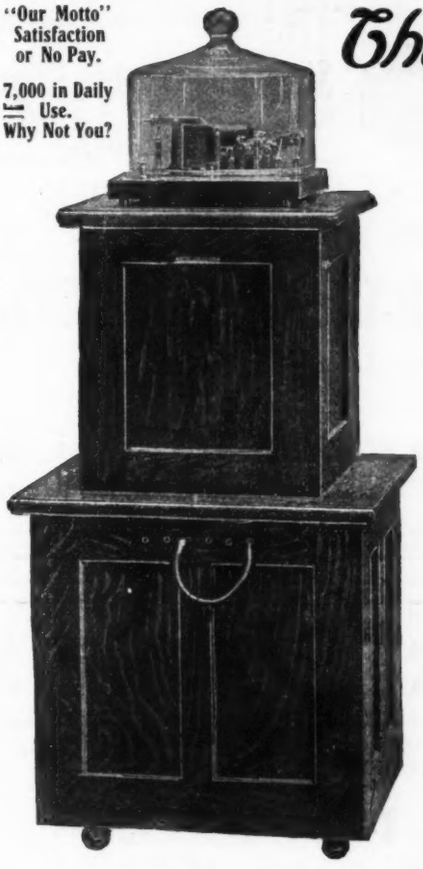
ESTABLISHED 1848

We Guarantee This Generator

To Ring Your Toll Lines Perfectly Regardless of Distance or Number of Phones

"Our Motto" Satisfaction or No Pay.

7,000 in Daily Use. Why Not You?



The Warner Dry Battery Outfit

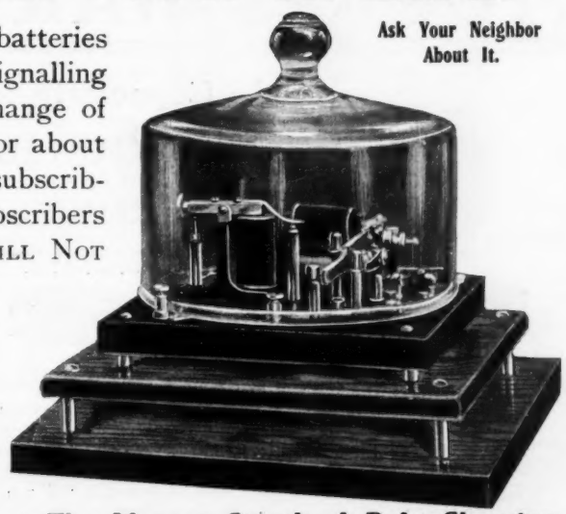
This cut illustrates the Warner Dry Battery Outfit. This outfit consists of 60 "best quality" dry batteries, one closed circuit battery for operating the vibrator (one charge of this battery will operate the vibrator continuously from 10 to 12 months, and much longer if shut off at night), one special condenser and one Warner Pole Changer, all contained in a handsome paneled oak cabinet, having glass cover as shown. The cabinet occupies a space of about 18x20 inches, and is about 40 inches high over all. When crated ready for shipment it weighs about 200 pounds.

The plug switch shown on front of cabinet is for the purpose of cutting the batteries in and out. In most cases 30 batteries are sufficient to do the hardest ringing, leaving a reserve of 30.

Cheapest Power on Earth

As one set of batteries will furnish signalling power for an exchange of 100 subscribers for about 24 months; 200 subscribers 15 months; 300 subscribers 12 months; 500 subscribers 8 months; or in other words, the TOTAL COST WILL NOT EXCEED TWENTY-FIVE CENTS PER MONTH for each 100 subscribers. The machine proper is indestructible, as there are no wearing parts whatever, except in five contact brushes and three contact pins. The brushes will last two or three years without renewing and only cost 25c each. Contact pins cost 30c each, but should last five years or more. THERE IS NO LIMIT to our machines, as by adding to the ringing batteries you increase the voltage.

Ask Your Neighbor About It.



The Warner Standard Pole Changer.

The above cut shows our machine complete except the batteries. One cell of closed circuit battery and about 50 cells of open circuit batteries (either dry or solution) will be required.

Dry Battery Outfit - $45.00
Pole Changer Only - $25.00

Manufactured Exclusively by WARNER ELECTRIC COMPANY MUNCIE, INDIANA

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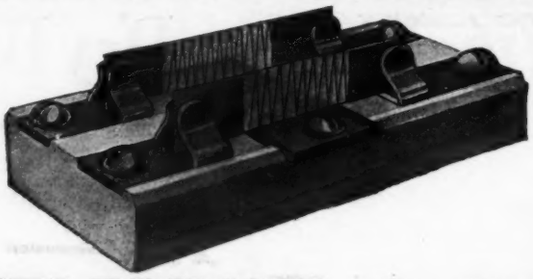
CENTRAL PROTECTORS

CENTRAL PATENT-WRAPPED FUSE
Used in all CENTRAL PROTECTORS.

Mention This Ad and Send Request to



Single or Double Line Fuse Block SAMPLE FREE

CENTRAL TELEPHONE & ELECTRIC CO.

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OR

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DUNCAN-HOBSON ELEC. CO., Dallas, Texas.

MORRIS HARD FIBRE CLEATS

Made Especially for Telephone Installations

JUST WHAT YOU HAVE BEEN LOOKING FOR

STYLE "A"

Made with single groove for twin or parallel wires.

DIMENSIONS
¾-in. long 13/32-in. wide
¼-in. thick ¼x⅛-in. groove
PRICE, $4.30 PER 1000

STYLE "B"

Made with two grooves and especially adapted for twisted pair telephone wires. Only one screw necessary to hold Cleat firmly in position.

DIMENSIONS
¾-in. long 13/32-in. wide
¼-in. thick ⅛x⅛-in. groove
PRICE, $4.50 PER 1000

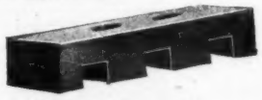
STYLE "C"

This is our Baby or Corner Cleat, the smallest, strongest and neatest cleat on the market, and "comes in handy" everywhere. Have you used them? If not, ask us for samples at once.

DIMENSIONS
11/16-in. long 13/32-in. wide
¼-in. thick ¼x⅛-in. groove
PRICE, $4.00 PER 1000

STYLE "D"

Made for three wires and takes up very little room. If installed with brass or nickel screws, makes a very pleasing appearance.



DIMENSIONS
1⅛-in. long 13/32-in. wide
¼-in. thick ⅛x⅛-in. groove
PRICE, $6.50 PER 1000

THE MORRIS HARD FIBER CLEATS are neat, durable, easy to install, good insulators, and on account of the finished appearance they make, are just the thing for office or residence installation. They are gradually taking the place of the clumsy wood and porcelain cleats. In ordering be sure and mention which color you prefer—**Red, Gray or Black,** otherwise we will send red.

MORRIS ELECTRIC CO., Inc., Wilmington, Delaware

MANUFACTURERS OF FIBRE AND FIBRE SPECIALTIES

OUR CLEATS CARRIED IN STOCK AT THE FOLLOWING AGENCIES:

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American Electric Co., St. Paul, Minn.
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Farr Telephone & Construction Supply Co., Chicago, Ill.
Creaghead Eng. Co., Cincinnati, O.
Southwestern Electrical Engineering & Construction Co., Dallas, Texas.
Western Electric Co., Philadelphia, New York, Chicago, Denver and Omaha.
Novelty Electric Co., Philadelphia, Pa.
Standard Electric Co., Norfolk, Va.
E. G. Bernard Co., Troy, N. Y.

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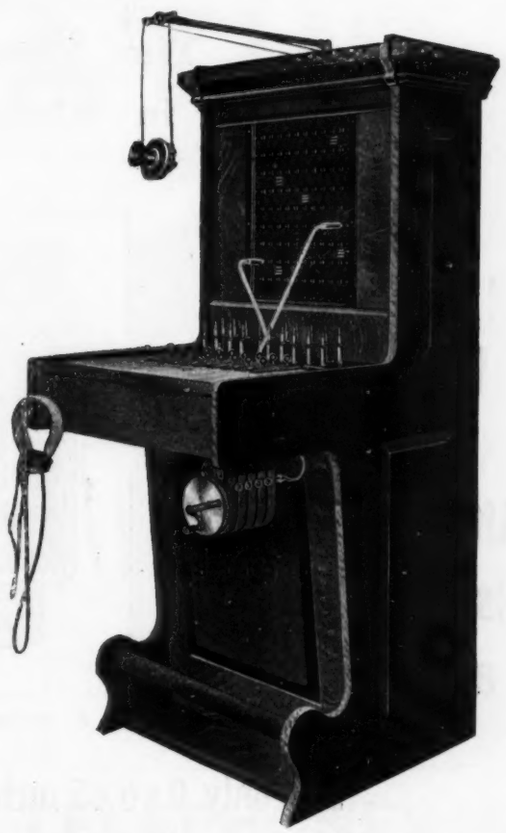
CENTURY
100% GOOD

Common Battery Equipments

The Century Methods of Constructing Common Battery Apparatus is Correct, Mechanically and Electrically.

This is Proven by the Reliable and Efficient Manner in which Every Century Equipment has been Operating.



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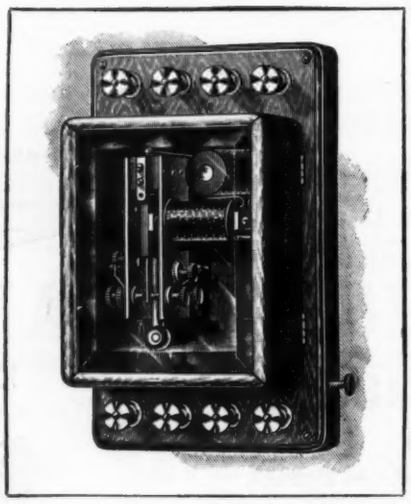
FACTORY & WAREHOUSE
481-489 WASHINGTON ST.

BUFFALO, N.Y.

ILLINOIS POLE CHANGER

The Latest Development in Ringing Generators

Is Adapted to Use Where Either or Both Alternating and Pulsating Currents are Required.



NUMBER 1 STYLE

Absolutely Guaranteed to Meet All Ringing Requirements. Will Ship on Thirty Days' Trial.

Size only 9x6x5 inches. Weighs but five pounds.

Made Up in Four Different Styles.

Write for Descriptive Circular and Prices.

Illinois Electric Specialty Company

171-173 South Canal Street CHICAGO, ILL.

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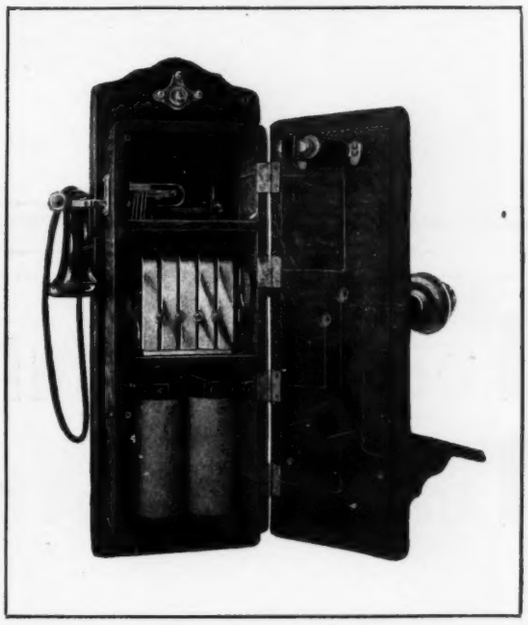
DEAN
TELEPHONE APPARATUS



OUR MAGNETO TELEPHONES

are fitted with transmission apparatus which will *talk perfectly* through the longest lines and with signaling apparatus which will *work perfectly* under all operating conditions — especially on heavily loaded bridging lines. *They also contain many other new features.* ∴ ∴ ∴

Let us tell you more about Dean Telephones in our little booklet No. 2, or better—send us an order for some phones *now* and give them a thorough trial.

THE DEAN ELECTRIC COMPANY
ELYRIA, OHIO

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Will you ever again buy cables as cheap as now?

Not unless copper takes a long drop,—and none of us look for that. On the present copper market we are selling cables way below what we should. That is plain to any man who figures it. Advances are certain, and coming quick.

Big orders are coming in, and more in sight. Everyone needs cable,—mostly big lots. Deliveries will be choked as badly as in 1902 and '03. (Remember them?)

Business is already heavier than most buyers think. Those now under cover are wise, because they will get *their* cables on time, and at present prices.

Profitable contracts for future delivery may be made now if you send us your specifications. Buy enough for all of 1905. It will be good property.

THE F. BISSELL COMPANY

TOLEDO, O.

Telephone and Telegraph Wire

Made by continuous process from the best Rods obtainable. Possesses great Strength and high conductivity. Pliable, yet tough and uniform.

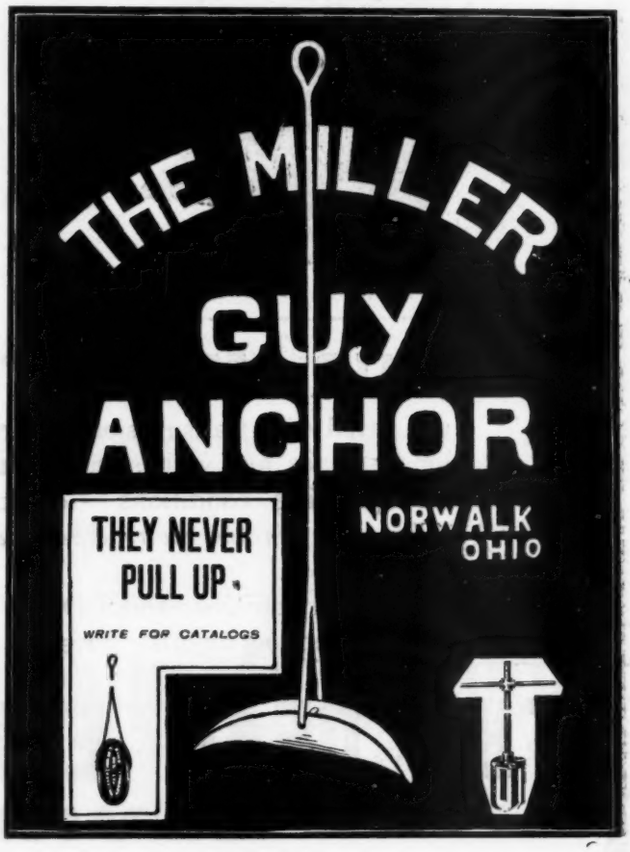
GUARANTEED STANDARD

Our Wire is known to the trade as, "Extra BB," "BB" and "Steel."

Your orders are earnestly solicited. Write for our quotations and Special Discounts.

Indiana Steel & Wire Co.

MUNCIE, INDIANA.



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There Are Others, But This One Was Caught In the Act.

The Vought-Berger Company

Makers of First-Award

TELEPHONES, SWITCHBOARDS AND APPLIANCES

La Crosse **Wisconsin**

The Controller Company of America

invites you to investigate

The Stroud System of Measured Service

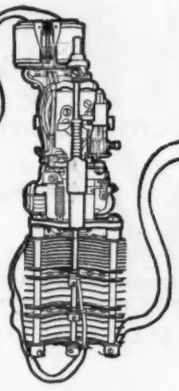
Before making new plans for exchanges send for one or all of the following booklets:

"Deadheads vs Dividends"
"Analogy in Gas."
"Something about Tokens."
Bulletin No. 1.
Bulletin No. 2.
Bulletin No. 6.

They will all contribute toward a better understanding of the telephony of the future.

The Controller Company of America
1061 Monadnock Block CHICAGO

Please tell the Advertiser you saw his Announcement in TELEPHONY.

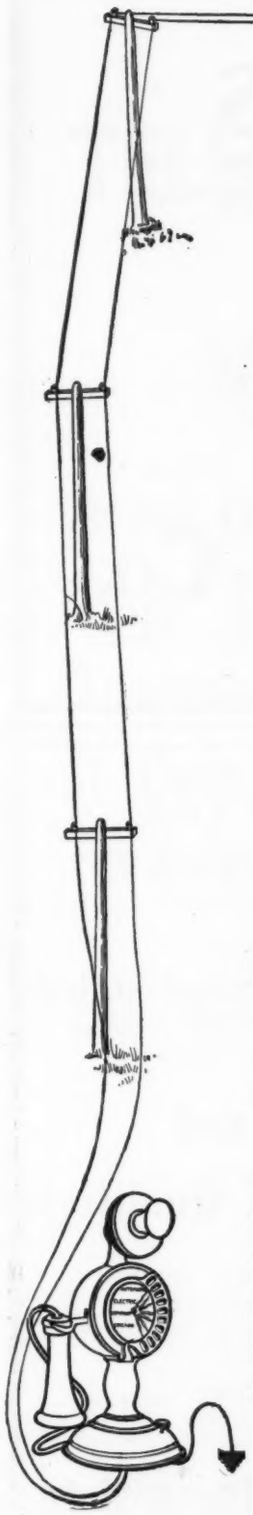


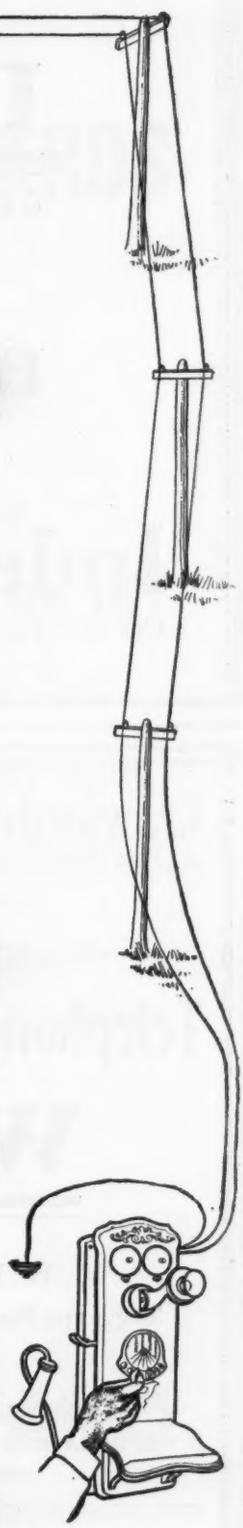
OUR
AUTOMATIC TELEPHONE SYSTEM
Wins
THE GRAND PRIZE
at the
WORLD'S FAIR,
ST. LOUIS,
in
Open Competition With the World

We are the only **Independent** Telephone Manufacturers to receive this, the highest honor the officials could confer.

The same superiority of equipment which won this award for us has caused the adoption of our apparatus by Independent companies in the following cities:

Chicago, Ill.	Auburn, Maine	Augusta, Ga.	Battle Creek, Mich.
Grand Rapids, Mich.	Fall River, Mass.	Medford, Wis.	Clayton, Mo.
Columbus, Ohio	New Bedford, Mass.	St. Mary's, Ohio	Pentwater, Mich.
Dayton, Ohio	Los Angeles, Calif.	Woodstock, N. B.	Toronto Jct., Can.
Lincoln, Neb.	San Diego, Calif.	Westerly, R. I.	Wilmington, Del.
Portland, Maine	Hopkinsville, Ky.	Manchester, Iowa	Riverside, Calif.
Auburn, N. Y.	Sioux City, Iowa	Princeton, N. J.	Traverse City, Mich.
Lewiston, Maine	Cleburne, Texas	Albuquerque, N. M.	and Berlin, Germany
	Columbus, Ga.	Van Wert, Ohio	





AUTOMATIC ELECTRIC CO.
CHICAGO, U. S. A.

Independent Dry Battery Co.

Manufacturers of

DRY BATTERIES

especially adapted to Telephone work

We sell direct to Consumer

High Quality Long Life

Send us a trial order and be convinced

Independent Dry Battery Co.

181-183-185 Jackson Boulevard CHICAGO, ILL.

Crawfordsville Wire and Nail Co.

MANUFACTURERS OF

"MONARCH" BRAND HIGH GRADE

Telephone and Telegraph WIRE

E. B. B.-B. B.-STEEL

Single and Double Galvanized Signal Strand

OUR WIRE STANDS THE MOST EXACTING TESTS.
IF YOUR SUPPLY HOUSE CANNOT FURNISH IT, WRITE US. WE CAN.
PROMPT SHIPMENTS ALWAYS.

CRAWFORDSVILLE WIRE & NAIL CO.

CRAWFORDSVILLE, INDIANA, AND 1501 MONADNOCK BLDG., CHICAGO.

TELEPHONES and SWITCHBOARDS

Second Hand but Reconstructed

in a manner which guarantees

Original Appearance and Operating Qualities.

One Thousand Exchanges are purchasing reliable apparatus of this Company at reduced prices.

Why not You?

Write for Stock List. All Standard and Modern Makes.

Guarantee Telephone and Equipment Co.

60 W. Jackson Boulevard,
CHICAGO, ILL.

Now Is The Time

TO ORDER YOUR

TELEPHONES AND SWITCHBOARDS

FOR THE NEW YEAR

SPECIAL PRICES ON QUANTITY LOTS.

Order Our Type "E" Transmitter. It Does Not Pack Up.

Order Our No. 147 Desk Set. Brand New, None Better.

Our finish and lasting qualities are known all over.

The Phones made by us TEN years ago are giving better service to-day than those made by others four years ago.
THINK ABOUT IT.

STANDARD TELEPHONE AND ELECTRIC COMPANY

Office and Factory **MILWAUKEE, WIS.**

Please tell the Advertiser you saw his Announcement in TELEPHONY.

THE SOLDER USED

In

Kaisling Self-Soldering Cartridges

Is

INSULATED

From the Talking Circuit

Kaisling Cartridges are Easily Inserted or Removed

THEY ALWAYS PROTECT
LOW PRICES

AMERICAN ELECTRIC FUSE CO.

CHICAGO NEW YORK ATLANTA

EVERYTHING IN PROTECTION

ALL OPERATING CONTACTS

On

Kaisling Self-Soldering Protectors

Are of

PLATINUM

All other contacts are soldered

No Connections Made Through Bolts or Nuts

POOR CONTACTS IMPOSSIBLE
SAMPLES FREE

AMERICAN ELECTRIC FUSE CO.

CHICAGO NEW YORK ATLANTA

EVERYTHING IN PROTECTION

Please tell the Advertiser you saw his Announcement in TELEPHONY.

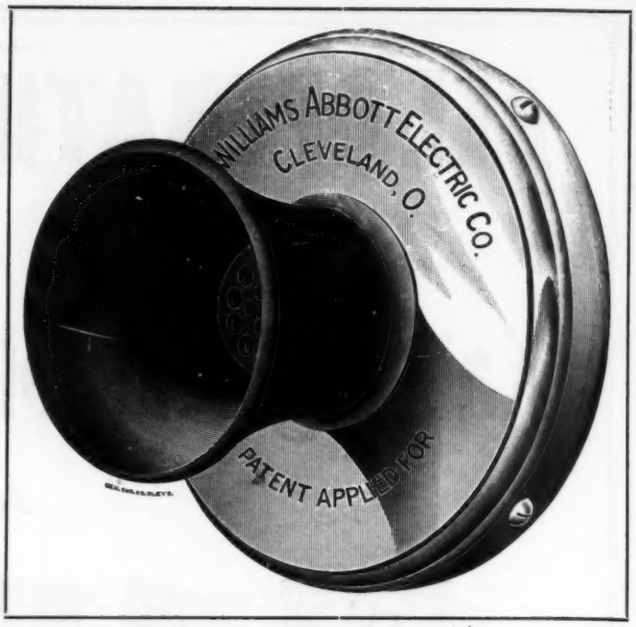
Adopted by U. S. War Dep't.

SAMPLE FREE

To Established Exchanges and Farmer's Systems.

The Government Building St. Louis Exposition is equipped with our No. 147 desk set selected because of its substantial construction and efficiency.

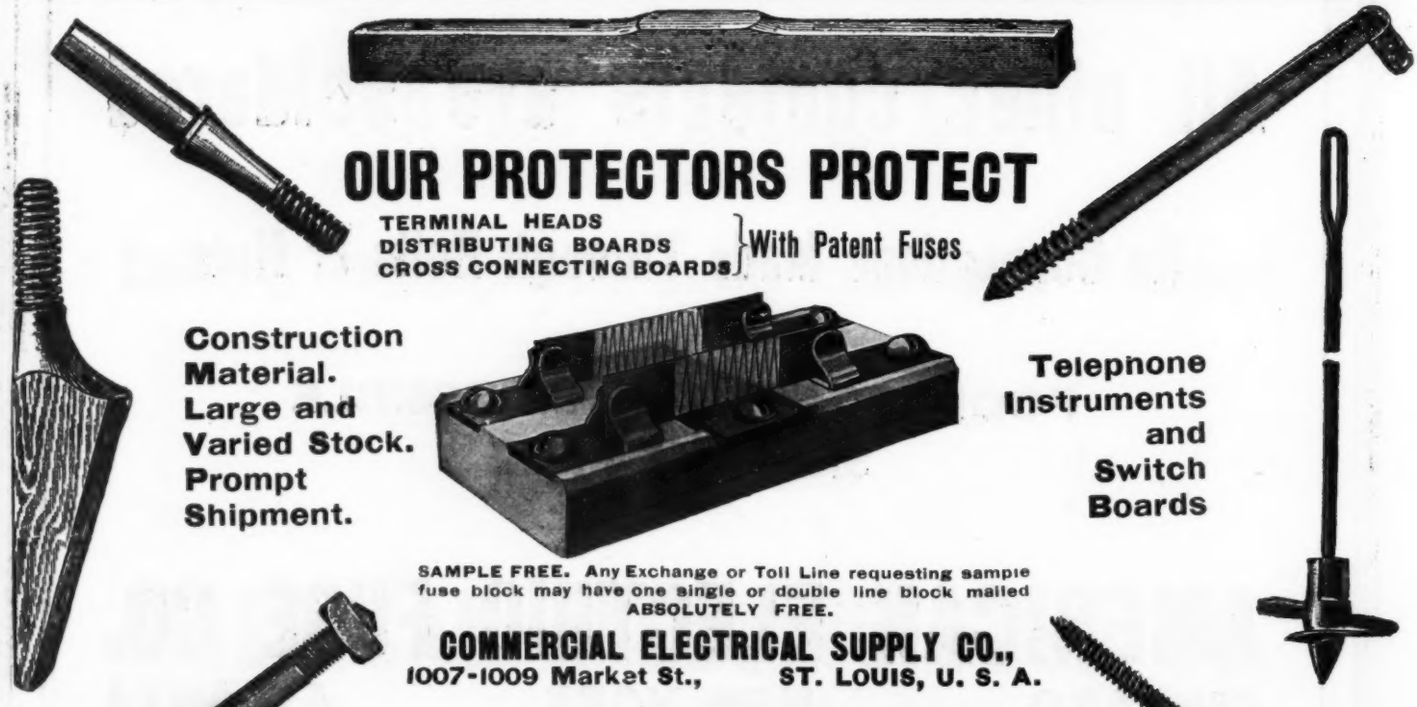
Our transmitter for central battery service is unequaled. If your instruments give trouble, try one, will cost you nothing.



Send for Catalog C2.

The Williams-Abbott Electric Co.

CLEVELAND **OHIO**



OUR PROTECTORS PROTECT

TERMINAL HEADS
DISTRIBUTING BOARDS } With Patent Fuses
CROSS CONNECTING BOARDS

Construction Material. Large and Varied Stock. Prompt Shipment.

Telephone Instruments and Switch Boards

SAMPLE FREE. Any Exchange or Toll Line requesting sample fuse block may have one single or double line block mailed ABSOLUTELY FREE.

COMMERCIAL ELECTRICAL SUPPLY CO.,
1007-1009 Market St., ST. LOUIS, U. S. A.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

The "LORIMER"

The SYSTEM of the FUTURE

FULL AUTOMATIC and CENTRAL ENERGY

Patents Granted

Great Britain	New Zealand
France	South Australia
Belgium	New So. Wales
Italy	Queensland
Spain	United States
Sweden	Denmark
India	Austria
Cape of Good Hope	Hungary
Mexico	Canada
Victoria	

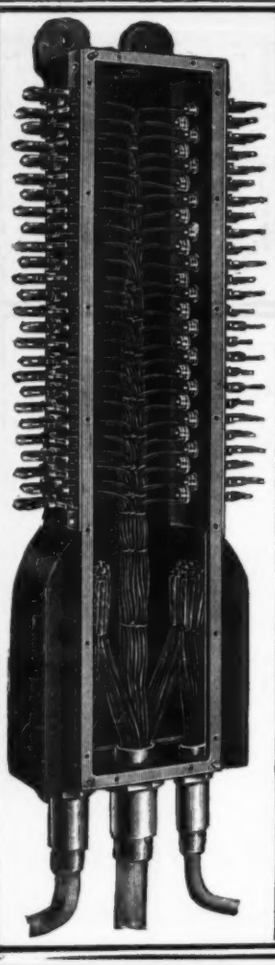
Patents Pending

Germany	Japan
Norway	United States (5)
Russia	

THE AMERICAN MACHINE TELEPHONE CO., LT'D
Piqua, Ohio, and Brantford, Canada

THE CANADIAN MACHINE TELEPHONE CO., LT'D
Toronto Canada

XUM



Moon Combination Terminal Head and Junction Box

WITH this apparatus the most economical plan of cable distribution may be used. A main lead of cable extends from the exchange, with smaller cable branching off to various points of distribution, the cable splices being made in the terminal head.

No sleeve splices or wipe joints are necessary. Your own line men can perform all the work of installing the cable, do it quickly and do it well. Has

Fuse and Carbon Protection,
Self Soldering Nozzles.
Metal Outer Case of Pole Box.

Made to distribute any number of wires, with either two or three Nozzles, for cable up to 200 pair, or larger.

One great feature is the facility always afforded for testing the cables.

It is adapted for multiple distribution.

WRITE TO US ABOUT IT.

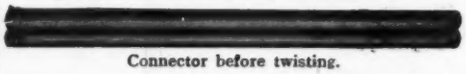
Moon Mfg. Co.

43 So. Canal St. Chicago

LEST YOU FORGET

We carry a complete Line of TELEPHONE SUPPLIES

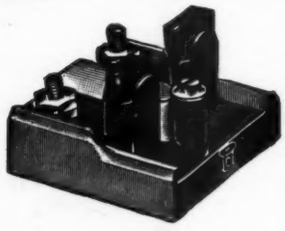
"Veribest" Glass Fuse.
Patent Pending.



Connector before twisting.

Connector after twisting.

Standard for Accuracy

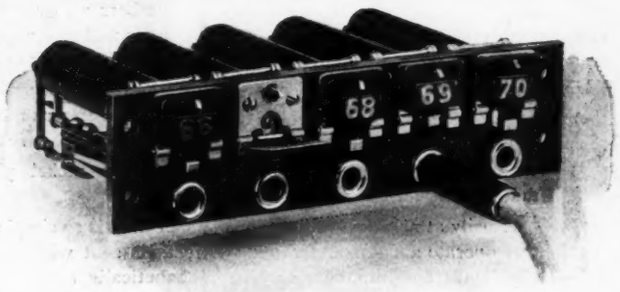


Chicago Fuse Wire & Mfg. Co.

CHICAGO 358 Dearborn Street
NEW YORK 853 Broadway
BUFFALO Mutual Life Building

Please tell the Advertiser you saw his Announcement in TELEPHONY.

More About the Monarch Switchboard



Cut of front of drops and jacks.

The drops and jacks like all other parts show the

Monarch Method

of simple construction. Simplicity of design, combined with substantial construction and perfect workmanship has made Monarch Products famous.

Note the Desirable Features

Drops and jacks mounted five per strip on steel mounting plate.

All drops entirely insulated from mounting strip and from each other.

Armature mounted in front of coil, thus giving a short throw to the shutter hook and increasing the efficiency.

Armature adjustment absolutely permanent. Removal of coil does not affect the adjustment.

Any drop coil can be removed without breaking a soldered connection.

Coils wound to any resistance desired.

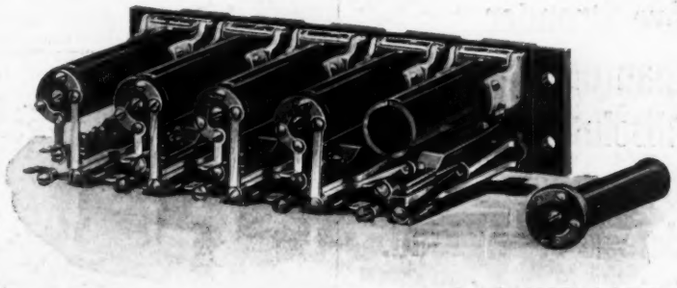
Jack mounting rigid.

No electrical connection through jack sleeve. Springs supplied for both tip and sleeve contacts.

A sure restoring device.

All parts interchangeable.

Further particulars and price sent upon request.



Cut showing rear of drops and jacks.

MONARCH TELEPHONE MFG. CO.

12-16 South Clinton Street Chicago, Illinois

Please tell the Advertiser you saw his Announcement in TELEPHONY.

XUM

We Have What You Want.

Saves brain work and hours of time. Busy man's friend. A ready index call device for telephones. Necessity to every user of the telephone.

Just the thing for listing of names and call numbers, does away with the writing of names and numbers all over the wall, woodwork, frosted windows, pieces of paper and tacking upon the wall, in books and misplacing and not able to find when wanted.

For constant communication with customers, the appliance is indispensable. Home use, for listing such names as the grocer, butcher, doctor, druggist or friend, it fills a long felt want.

Made of spring steel and brass, highly nickel plated to match telephone.

Easily attached to wall or desk 'phone and is so simple a child can operate and understand it. Directions sent with appliance.

Names and numbers can be alphabetically arranged on the ribbon by pen, pencil or typewriter and found instantly.

Retails for $1.50.

Rapid seller. Seeing's believing.
Special inducements to agents.

Telephone Appliance Company

Dept. A, 1 Madison Ave. **NEW YORK CITY**

Washington Fir Cross Arms Last twice as long as Ordinary Arms. Are Stronger than other arms. Absolutely Free from knots or defects of any kind. Prices average as low as asked for Pine Arms.

Washington Fir Trees.

These trees often attain a height of 90 to 100 feet before branching. The logs are sometimes sixteen, eighteen or twenty feet in diameter, and are never hollow.

Knoxville, Iowa, June 25, '04
Illinois Electric Co., Chicago.

Gentlemen:—The Washington Fir Cross Arms recently received from you are the finest lot of Arms that we ever saw. They are of uniform quality, of excellent grain and soundness. The mill work and borings have been very carefully done according to specifications. It was impossible to pick out the best arm, as we usually do, for places of heavy strain, as they were all apparently of the best quality. How anyone would think of using pine arms when these can be had at the price we paid for them we are at a loss to understand, as we certainly consider them the cheapest Arm we have ever bought. We thank you for your promptness in shipping.

Yours truly,
Knoxville Electric Co.
P. E. Bellamy, Gen. Mgr.

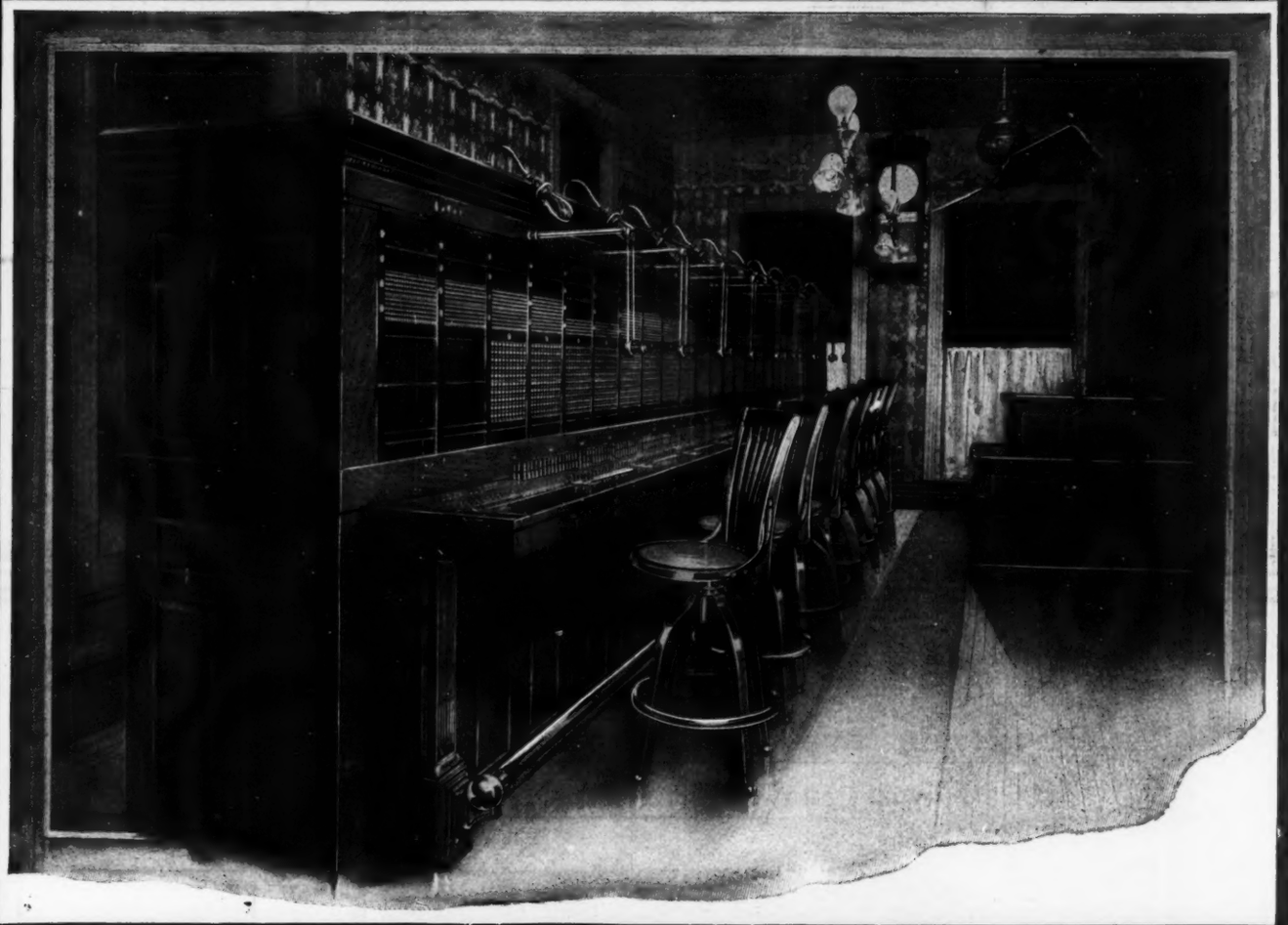
Illinois Electric Company,

Electrical Supplies,

239-241 Madison Street, CHICAGO.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Where Quality Stands First



MAKERS OF TELEPHONE APPARATUS

Multiple Boards — Transfer Boards — Village Boards

Central Energy — Magneto Call

Exchange Telephones — Rural Telephones — Factory Telephones

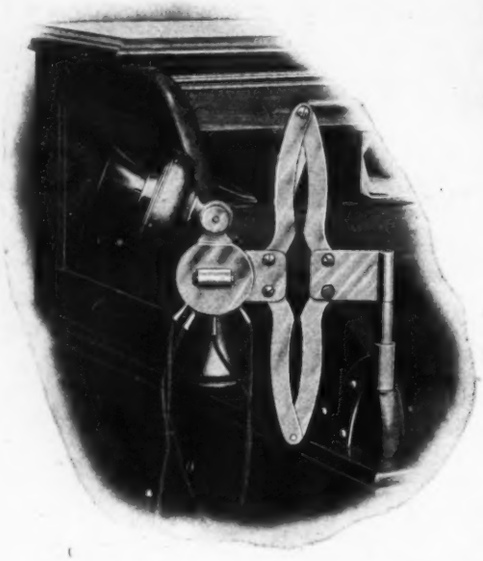
MANUFACTURED DIRECT FROM THE RAW MATERIAL

THE NORTH ELECTRIC COMPANY

WRITE FOR CATALOG

149-159 Clair St., CLEVELAND, OHIO

Please tell the Advertiser you saw his Announcement in TELEPHONY.



The Adjustaphone

The Ideal Telephone. Costs no more to install than the old style breakable kind. The cost to maintain is nothing, as it cannot fall or break. ***The time and expense of sending troublemen to make insignificant repairs that you can not charge for, is reduced to the minimum.*** Your subscribers cannot be careless with an *ADJUSTAPHONE*—it will take care of itself anywhere you put it and ***save its cost to you once every year.*** Made for any transmitter, receiver or system, and for any style desk. Write for particulars and prices. Both will interest you.

TELEPHONE DEPARTMENT

Chicago Writing Machine Co.

MANUFACTURERS 212 WENDELL STREET, CHICAGO

Up with the Dividends

Dividends are what you are looking for

Flat rate won't make them ✓ Measured Service will

The Measured Service Meters which Records both at Central and at Subscribers' end.

STYLE A

The Subscriber cannot dispute when he does his own recording.

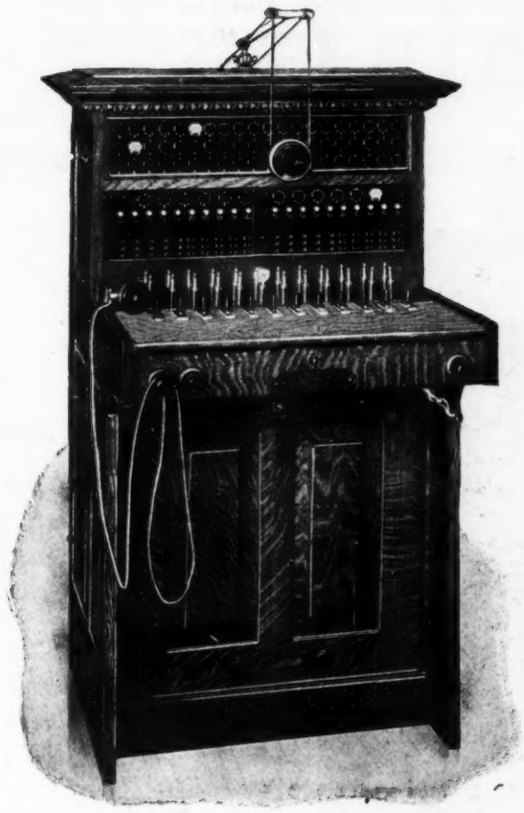
COLLECTORS ABOLISHED.

Don't fail to investigate our Meters at the Inter State Convention

Measured Service Company, 153-159 S. Jefferson Street, CHICAGO

OUR No. A-2766 CABINET

For Generator-Call or Central Energy Exchanges



We build this type of board principally for Private Branch Exchanges.

It is convenient to operate, the key shelf being only 31 inches high, well proportioned and presents a fine appearance.

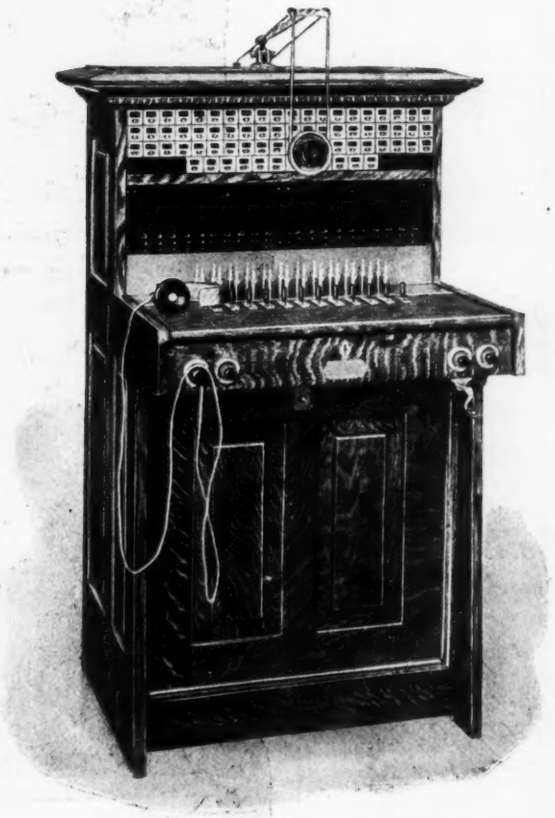
It makes a very satisfactory, inexpensive toll board.

We describe it as such in our Bulletin No. 12-C.

The sections are so designed and constructed that additional sections may be added as required.

The illustration at the right shows this type of cabinet equipped with 60 Generator-Call Visual Line Signals, 12 pairs cords, 12 Clearing-Out drops, 1 Operator's equipment complete.

We can also furnish this cabinet equipped with either Lamp or Central Energy line signals.



The two Boards above illustrated are fully described in our Bulletin No. 6-C.

Bulletins mailed free upon request.

STROMBERG-CARLSON TELEPHONE MFG. CO.

General Offices: ROCHESTER, N. Y. **Western Sales Office: CHICAGO, ILL.**

Please tell the Advertiser you saw his Announcement in TELEPHONY.

A Valuable Book Free

IN SPEAKING OF IT THE ELECTRICAL WORLD AND ENGINEER SAYS:

"We have received a copy of 'Independent Telephone Practice,' compiled by Messrs. I. J. Kusel and A. E. Dobbs. This booklet contains valuable information for the independent exchange electrican and operator. While the subject matter contained has been in a measure treated before, there has been no book compiled that places this matter and data thus together, in a manner so simple that it may be easily understood by the layman. It is the simplicity and instructiveness of the book that will make it valuable. The Eureka Electric Company, of Chicago and Genoa, Ill., is distributing this, with its compliments, to any company or individual desiring a copy. It is decidedly worth securing by anyone interested."

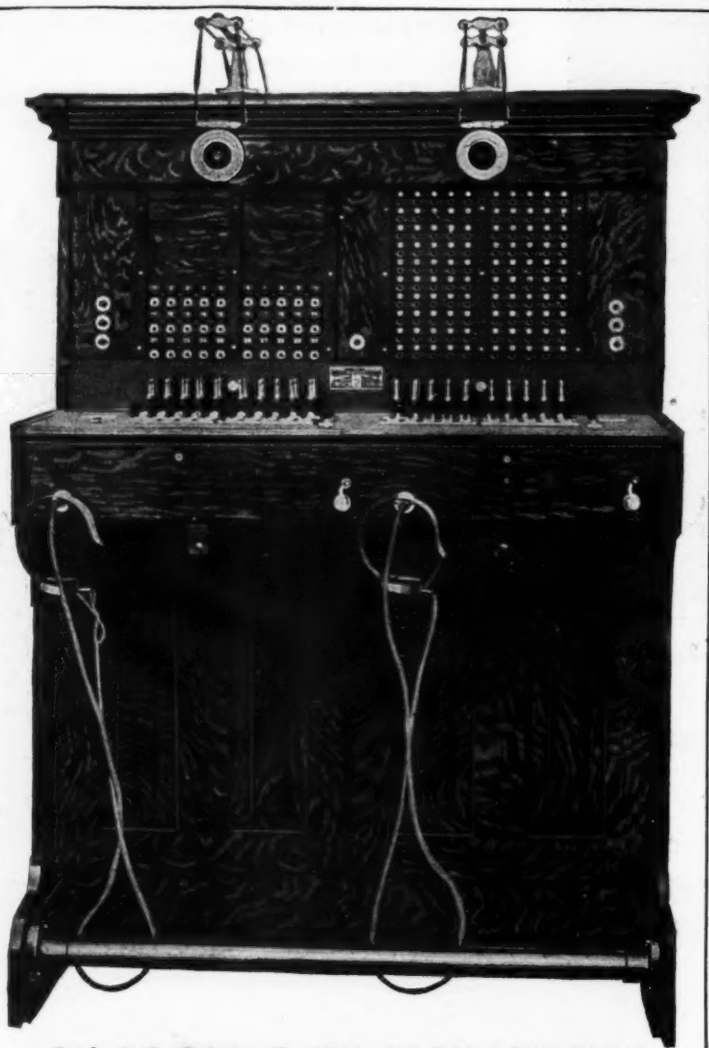
Could they say more.

It's as good as our apparatus.

It could not be better.

Our "Ring-Thru" Telephones Equipped with "Ring-By" Coils "not condensers"

At right prices all illustrated in new No. 33 Catalog.



Style 2-C, Cabinet Combination Lamp Line Signal Central Energy Switch Board.

Send for Independent Telephone Practice, Distributed by us Gratis.

Write us to-day for our No. 33, 1905 Catalog. Just out.

EUREKA ELECTRIC CO.

CHICAGO and GENOA, ILL., U. S. A.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Intercommunicating Wall and Desk Telephones

For Warehouse, Office, Factory, etc. We manufacture our own apparatus and maintain a high standard and guarantee our instruments to be perfect electrically and mechanically.

Workmanship is of the best and only materials are used that will give perfect service under most severe conditions.

Estimates furnished on application for complete installations except labor.

Everything in Telephones and Telephone Supplies.

GENERAL TELEPHONE CATALOGUE No. 19
TELEPHONE PARTS CATALOGUE

Electric Appliance Company

TELEPHONE MANUFACTURERS ✓ ELECTRICAL SUPPLIES

Chicago and San Francisco

Please tell the Advertiser you saw his Announcement in TELEPHONY.

OUR TELEPHONE APPARATUS

Stands for Quality, Durability and Efficiency. There are no better instruments made than our "Willams-Abbott" and "Central." Our transmitters are the solid back type, clear and distinct; our generators are ample and our bells loud ringing.

Our stock of construction material and appliances is also large and our prices attractive. We particularly recommend **OKONITE** for use wherever rubber covered wires are needed. ∴ ∴

Central Electric Company,

Elecrical Supplies

264-266-268-270 FIFTH AVENUE CHICAGO

Look for the Tags

They are your protection against inferior quality

Our

Telephone and Telegraph Wires

are

Extra Double Galvanized

with the finest grade of pure zinc. Every bundle bears a tin tag and lead car seal, as shown in the photographs, and is

Guaranteed Standard Quality

THE NATIONAL WIRE CORPORATION

WORKS: NEW HAVEN, CONN.

General Offices: Engineering Building, 114-116 Liberty St., NEW YORK, N. Y.

Sales Offices and Warehouses:

New York, Boston, Chicago, DeKalb, Kansas City, San Francisco

WIRE ROPE ∴ WIRE STRAND

Ask for Special Price Lists, with Tables.

American Electric Telephone Co.

CHICAGO, ILL.

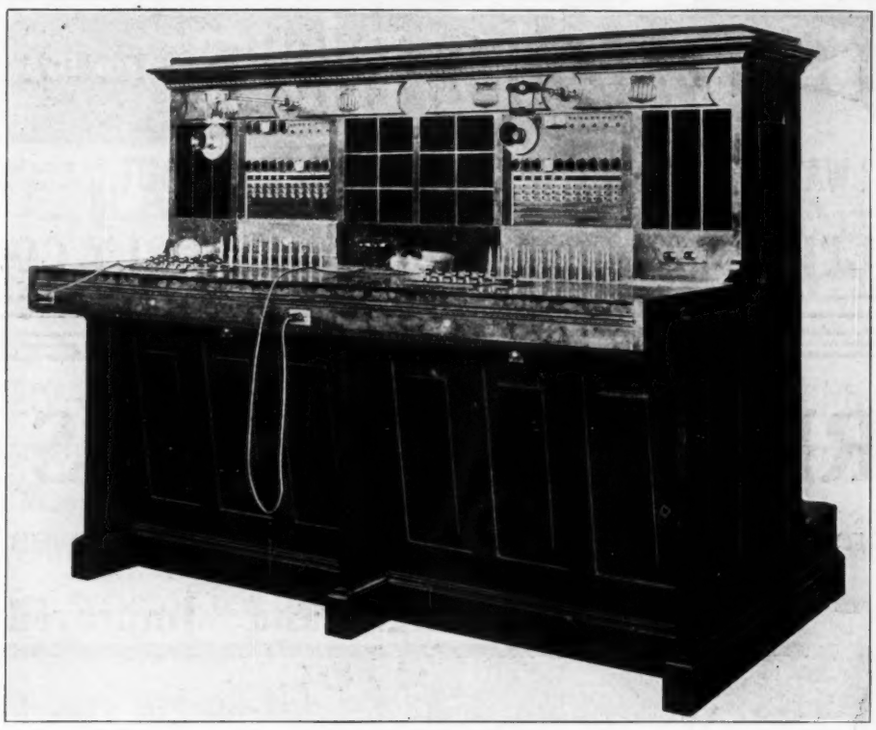
Largest Manufacturers of Complete Telephone Exchanges and Equipments

MAGNETO and CENTRAL ENERGY SWITCHBOARDS
MAGNETO and CENTRAL ENERGY TELEPHONES

Terminals

Toll Boards

Supplies



Protective Apparatus

Private Branch Exchanges

Power Equipment

TOLL BOARD

The above toll board is a sample of our high class work.
We have built the largest toll boards now in use.

Write to us for prices and particulars.

Our new descriptive bulletins are just out. Send for them.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Farr 1905

In Telephones We Lead

High Grade 1905 TELEPHONES

Orders Filled Same Day We Receive Them.

Carry Large Stock of Telephone Supplies, Brackets, Pins, Cross Arms, Glass Insulators, Knobs, Galv. Wire, Office Wire, Pole Steps, Lag Bolts, Arm Braces, Linemen's Tools,

Every telephone man wants to know all about the new device **WATKINS SELECTIVE RINGER AND LOCK OUT** For party lines, grounded or metallic; ten or twenty on a line. Moderate price.

Ask for our new Catalogue No. 17. Gives useful instructions for telephone men

FARR TELEPHONE & CONSTRUCTION SUPPLY CO. 118 W. JACKSON BLVD. CHICAGO

BAIRD PAY STATIONS PAY

tremendous profits on the investment as is proven by

Increased Dividends and Improved Service!

We are constantly receiving repeat orders for our apparatus from our many customers which proves conclusively that

BAIRD PAY STATIONS PAY!

Write for catalogue or information to

BAIRD MANUFACTURING COMPANY

3 Michigan Street : : : CHICAGO, ILLINOIS

New Western Non-Interfering Telephone

For Use on Either Grounded or Metallic Lines

Any party can call others on the line without signalling central.
Central can be called by any party without calling other parties on the same line.
More bells on any line can be rung satisfactorily than by any other type of telephone made.
All the bells on the line can be rung perfectly even when all the receivers are off the hooks.

We make the only telephone which will do all these things on either a grounded or metallic line

Western Telephone Mfg. Co.

Chicago

The Pioneer Independent Telephone Factory

Please tell the Advertiser you saw his Announcement in TELEPHONY.

XUM

TELEPHONES

THAT ARE

Guaranteed Indefinitely

It would pay you
to investigate

We carry as large a stock of supplies as anyone—and make specialty of prompt shipments—Send for catalogues

EWING-MERKLE ELECTRIC COMPANY, St. Louis

MADISON TELEPHONE MFG. WIS. U.S.A.

We Extend You A Hearty Invitation

To call on us in

Room 612, Auditorium Hotel

During the

Convention

December 13-14-15, '04

We want to talk to you
and show you

Our Removable Induction Coil
Our Up-to-Date Telephones
The Ritter Soldering Iron and
A. K. Duplexers
Our Washington Fir X Arms

and a multitude of other things.

Independent Telephone Manufacturing Co.

Madison, Wis.

WIRE

Interior Telephone "Monarch"
W. P. Iron, Bare Iron and
Steel Galvanized Messenger

WIRE

All are carried in stock by

Monarch Electric & Wire Co.

125-127 S. Clinton St.,
CHICAGO.

1905 will be the banner year of Independent telephony. It will be our most interesting year. At no time has TELEPHONY been so strong as now, and our plans for the new year promise many things for the subscriber, advertiser and publisher. In spite of the fact that subscribers of TELEPHONY have grown into such an enormous family during the past year, we like to feel the sense of kinship that comes of hopes and aims in common, and plans and successes shared together. We shall expect a still larger family during the year to come, and we know our work for the upbuilding of the Independent movement is being more appreciated every month. The January TELEPHONY begins our ninth volume and fifth year. As an ernest of what subscriber and advertiser may expect for the next year we point to this and the preceding issues of TELEPHONY. We want everybody interested in the industry (and nearly everybody of any consequence in the business reads TELEPHONY) to carefully examine this issue. Read carefully the hundred and four pages of reading matter, written by the ablest writers in the world. Certainly a list of names of which we are proud. Look at the wealth and excellence of our illustrations—the advertising pages which form a directory of the telephone manufacturing industry. From all sides isn't TELEPHONY just about the biggest, strongest and best trade paper you have ever read? During 1905, with the help of subscriber and advertiser we will make this publication the greatest of its kind in the world. We extend to you the season's compliments and wish you full measure of prosperity and happiness.

XUM

TO THE PEOPLE OF IOWA:

This map shows how any number of Telephone Companies can combine for long distance business.

Under Sec. 2161 of the Code of Iowa the Telephone Companies and the Railway Companies can be made to recognize this combination. The farmer is going to be the absolute dictator of the telephone business and no person and no corporation can oppose him and live. Now is the time to meet the farmer and get him to do right.

TO THE PEOPLE OF IOWA: The Rogers Telephone Company for West Union through C. H. Talmadge, T. L. Green, F. Y Whitmore, H. P. Hancock, Omar A. Rogers, and myself have come to an arrangement with Vic H. Stevens, Ed. A. Hurmence and J. H. Shoemaker, through which all of their above marked lines will be connected for toll or long distance service. A standard basis for serving the farmer or mutual companies is being worked out. The Pleasant Ridge Telephone Company is a farmer owned company. Ambrose McGaharen is the long term director in this Company. We will make a deal with him in the early days of December through which a model will be had for town and farmer service combined. *We eagerly desire the farmer business.*

SUMMARY

October 1903--Standard account for telephone plants was published in Telephony.
April 1904 — The Rogers Telephone Company for West Union was incorporated upon lines of such account.
August 1904—The Rogers Telephone Company for Iowa was incorporated.
September 1904—The Rogers Telephone Company for Illinois was incorporated.
October 1904—The Rogers Telephone Company for Iowa has made relation with Ed. A. Hurmence, Vic H. Stevens, J. H. Shoemaker and Ambrose McGaharen which will result in a community of interest for the whole Independent telephone business in twenty cities. We shall support these men in this plan.

West Union, Nov. 20, 1904.

OSCAR WENTWORTH ROGERS.

TO THE PEOPLE OF IOWA

Make the Facts Public.

The one absorbing issue (excepting only the personality and accomplishments of President Roosevelt), in the national campaign just overwhelmingly closed in favor of the ticket headed by Theodore Roosevelt and C. W. Fairbanks, was the bringing to account and judgement the trusts and monopolies. The people of the land believe that Theodore Roosevelt will use his position and power to curb the wrongful and criminal methods of these foes to the public peace and prosperity.

Why should the people believe this.

January 3, 1900, Governor Theodore Roosevelt said to the New York Legislature:

"The men who endeavor to prevent the remedying of real abuses not only show callous disregard for the sufferings of others, but also weaken those who are anxious to prevent the adoption of indiscriminate, would-be remedies which would subvert our whole industrial fabric. The chicanery and the dishonest, even though not technically illegal methods through which some great fortunes have been made, **are scandals to our civilization.**

"The man who by swindling or wrong doing acquires great wealth for himself, at the expense of his fellow man, stands as low, morally as any predatory mediaeval nobleman, and is a more dangerous member of society. Any law and any method of construing the law which will enable the community to punish him, either by taking away his wealth or by imprisonment, should be welcomed. Of course such laws are even more needed in dealing with great corporations or trusts than with individuals."

December, 1901, President Roosevelt in his message to Congress, said:

"It is no limitation upon property rights or freedom of contract to require that when men receive from government the privilege of doing business under corporation form which frees them from individual responsibility and enables them to call into their enterprises the capital of the public, they shall do so upon absolutely truthful representations as to the value of the property in which the capital is to be invested. Co-operations engaged in inter-state commerce should be regulated if they are found to exercise a license working to the public injury. It should be as much the aim of those who seek for social betterment to rid the business world of crimes of cunning as to rid the entire body politic of crimes of violence.

"Great corporations exist only because they are created and safeguarded by our institutions: and it is therefore our right and our duty to see that they work in harmony with these institutions.

PUBLICITY THE FIRST ESSENTIAL.

"The first essential in determining how to deal with the great industrial combinations is knowledge of the facts—publicity. In the interests of the public the government should have the right to inspect and examine the workings of the great corporations engaged in inter-state business. Publicity is the only sure remedy which we can now invoke."

Theodore Roosevelt compelled the coal trust to arbitrate—thus obtaining the malicious hate of the coal barons.

President Roosevelt brought the Northern Securities Railroad Trust to the bar of the Supreme Court and to judgment. No microscope can find any love for Theodore Roooevelt in the heart of any railway bandit. That judgment was against them all.

The country is pledged to exterminate the criminal trusts. See the record of these intertwined venomous things. The money power cannot live unless the public servants are its corrupt tools.

President Roosevelt was not born to be a tool for anything—and so the money grabbers fear and hate him. While he is doing his duty he will probably have to call the attention of the Attorney-General to the Bell Telephone Trust.

The Supreme Court (by an unconscious lapse of judgment) conferred a monopoly right for telephoning upon the Bell Company, from 1876 to 1893. (See November, 1903, Telephony.

The Bell Company attempted a continuance of that monopoly through the Berliner patent. (Judge Brown finally decided against it, and the sharp, judicial tones are still ringing in the ears of the castigated leaders of the gang). The Bell appealed to the Supreme Court.

So it is with the Carty cases. Appealed.

The people have helped themselves, and have brought the telephone monopoly where judgment can be rendered. How about Iowa?

Iowa Independents have about .....41,000 miles of toll line.
Iowa Bell has about..... 7,000 miles of toll line.
Iowa Independents have about .....140,000 telephones.
Iowa Bell has about..... 20,000 telephones.
There are about 2,000 (unjoined) Iowa Independent Companies.
There is only one Iowa Bell Company.
Iowa Independents have an increase for 1904 of about 54,000 telephones.
Iowa Bell has not increased 2,000 telephones.
Iowa Independents have an increase, for 1904, of about 31,000 miles of toll lines (mostly farmers).

The late Post Master General ordered the Independent telephones out of certain postoffices (as in Minneapolis, La Crosse, Iowa City, &c., &c.)

Protests were made from different places.

"Washington, March 22, 1904. The House agreed to an amendment by Mr. Tawney, of Minnesota, providing that no part of the appropriation should be used to put Bell, or affiliated, telephones in the postoffices to the exclusion of Independent telephones."

Every member of any Independent Telephone Association, and every Independent Telephone Company should now write a letter to the Congressman representing its district, stating whether a Bell Telephone was alone in the local postoffice.

MAKE THE FACTS PUBLIC.

In December, 1903, Telephony the following was addressed to our Congressmen:

"See the annexed account for Washington. Think of $15 and $10 rate in Washington. This matter cannot be avoided. Every man must be either for or against the Bell. It is now trying to mislead one of the departments. It is desperate. I now call your attention to the Storrow-Seymour incident. In 1893, when the Bell's Berliner patent was being attacked by the Government, the Bell's attorney wrote a letter to the Commissioner of Patents. Here is the reply:

DEPARTMENT OF THE INTERIOR, UNITED STATES PATENT OFFICE.
Washington, June 1, 1903.

J. J. Storrow, Esq., Boston, Mass.

Sir:—I have your esteemed favor of May 31st and June 1st, **requesting this office not to divulge to any one and especially to the Department of Justice, or its counsel, or its representatives, a list of your requests for copies of papers on file here. While I note this request I ought also to say that the Department of Justice is regarded not only as the official legal adviser of the government but of this office as well, and it is understood that the Attorney General and his representatives have access to the secret files of this office, and that I could not properly refuse to comply with any official request of that Department for copies of such files, or of any files.**

It would seem that the Department of Justice and this office are one and the same arm of the government, and that the secrecy contemplated by law and provided for by the rules of the Patent Office does not exclude and was not intended to exclude the Department of Justice from any file or paper or transaction in this office.

Should occasion arise, therefore, I do not see my way clear to comply with your request. Very respectfully yours,

JOHN S. SEYMOUR,
Commissioner.

(Berliner Record, Vol. 2, page 1344.)

This letter is ground enough upon which to base an inquiry by Congress as to whether all requests of the Bell have been met in the honest manner of John S. Seymour. While your constituents are smashing the Bell monopoly in the field and on the farm is it asking too much of you to fight their foe from your seats in congress? Get the facts and then act. Give us a chance to be proud of you.

There should be a request from Congress, to the Commissioner of Patents asking for a complete record of the Bell Company's request for papers on file in the Patent Office. Make facts public. The Bell Company has done enough dirty work in the Patent Office, and now that the administration is cleaning up things, and now that the Patent Office is square, let the truth be known.

OSCAR WENTWORTH ROGERS.

West Union, Nov. 20, 1904.

XUM

OSCAR WENTWORTH ROGERS' ESTIMATE FOR TELEPHONE PLANTS IN MICHIGAN

Faller Automatic Operator.
ALL LINES UNDERGROUND.

ITEMS	Place	Place	Over 25,000, under 50,000		Over 10,000, under 25,000			Over 5,000, under 10,000			Over 2,000, under 5,000		
	Detroit 285,704	Grand Rapids 87,565	Bay City, 27,628 Jackson, 25,130 Saginaw, 42,345	Proposed Plant	TOWNS		Proposed Plant	TOWNS		Proposed Plant	TOWNS		Proposed Plant
	Acc't	Acc't	Name	Acc't	Name	Pop'n	Acc't	Name	Pop'n	Acc't	Name	Pop'n	Acc't
			Bay City		Alpena	11,802		Adrian	9,654		Albion	4,519	
			Jackson		Ann Arbor	14,509		Benton Harbor	6,562		Alligan	2,667	
Business Phones	6,000	1,000	Saginaw	800	Battle Creek	18,563	500	Cadillac	5,997	250	Alma	2,047	100
Residence Phones	12,000	2,000		1,700	Calumet	15,000	1,000	Cheboygan	6,489	500	Atlantic Mine	2,500	300
Business Rates	15	15		15	Ishpeming	13,255	15	Coldwater	6,216	15	Belding	3,283	15
Residence Rates	10	10		10	Kalamazoo	24,404	10	Escanaba	9,549	10	Bessemer	3,011	10
Av. Length Lines	½m.	½m.		½m.	Lansing	16,485	½m.	Holland	7,790	½m.	Big Rapids	4,686	½m.
Percentage Conduits	100	100		100	Manistee	14,260		Ionia	5,209		Caro	2,006	
Connectors per 100 Subscribers					Marquette	10,058		Iron Mountain	9,242		Charlevoix	2,079	
					Menominee	12,818	100	Ironwood	9,705	100	Charlotte	4,092	100
					Muskegon	20,818		Laurium	5,643		Crystal Falls	3,231	
					Port Huron	19,158		Luddington	7,166		Delray	4,573	
					Sault Ste Marie	10,538		Monroe	5,043		Dowagiac	4,151	
					West Bay City	13,119		Mt. Clemens	6,576		Durand	2,134	
						213,787		Negaunee	6,935		Eastlake	3,000	
								Owosso	8,696		Eaton Rapids	2,103	
								Petoskey	5,285		Fenton	2,408	
								Pontiac	9,769		Gladstone	3,380	
								St. Joseph	5,155		Grand Haven	4,743	
								Traverse City	9,407		Greenville	3,381	
								Wyandotte	5,183		Hancock	4,050	
								Ypsilanti	7,378		Hastings	3,172	
									158,649		Hillsdale	4,151	
											Houghton	3,359	
											Howell	2,518	
											Hudson	2,403	
											Ithaca	2,020	
											Lake Linden	2,597	
											Lapeer	3,297	
											Manistique	4,126	
											Marine City	3,829	
											Marshall	4,370	
											Midland	2,363	
											Mt. Pleasant	3,662	
											Munising	2,014	
											Niles	4,287	
											Norway	4,170	
											Otsego	2,073	
											Red Jacket	4,668	
											Reed City	2,051	
											South Haven	4,009	
											St. Clair	2,543	
ESTIMATED COST													
Central Equipm't.	360,000	60,000											
Subscribers' "													
Building	30,000	5,000											
Conduits	150,000	25,000											
Armoured Cables	221,256	36,876											
Manholes	27,600	4,600											
Engineering Exps.	60,000	10,000											
Contingencies	30,000	5,000											
Distributing, &c	216,000	36,000											
Total	$1,094,856	$182,476		152,065			91,238			45,619			24,360
											St. Ignace	2,271	
											St. Johns	3,388	
											Sturgis	2,465	
											Tecumseh	2,400	
											Three Rivers	3,550	
												150,500	
Capitalization per Phone	61	61		61			61			61			61
DEPRECIATIONS													
Conduits, 3%	19,144	3,524											
Other Plant, 6%	19,600	3,500											
Total	$38,744	$7,124		5,940			3,562			1,781			960
EXPENSES													
Engineer and Manager	9,000	1,500											
Assistants	4,320	720											
Sec.-Tr. and Bookkeepers	5,400	900											
Storekeepers	2,160	360											
Stenographers	5,760	960											
24 Inspectors @$720	17,280	2,880											
Heat, Light, &c	6,000	1,000											
Total	49,920	$8,320		6,950			4,160			2,750			1,500
SUMMARY													
Revenue	$210,000	35,000		29,000			17,500			8,750			4,500
6% on Capital	87,588	14,598		12,165			7,299			3,650			1,948
Depreciation	38,744	7,124		5,940			3,562			1,781			960
Expenses	49,920	8,320		6,950			4,160			2,750			1,500
Surplus	33,748	4,628		3,945			2,479			569			92

OSCAR WENTWORTH ROGERS' ESTIMATE FOR TELEPHONE PLANTS IN MICHIGAN

Faller Automatic Operator. ALL LINES UNDERGROUND.

Over 1,000, under 2,000

TOWNS.		Proposed Plant
Name	Popul'n	Acc't
Algonac	1,216	
Allonez	1,000	
Ausable	1,116	75
Bangor	1,021	125
Baraga	1,185	15
Bay Mills	1,200	10
Beacon	1,200	½m.
Beaverton	1,000	
Bellaire	1,157	100
Bellevue	1,074	
Birmingham	1,170	
Blissfield	1,268	
Bronson	1,176	
Buchanan	1,708	
Carrollton	1,000	
Cass City	1,113	
Cassopolis	1,330	
Central Lake	1,307	
Chelsea	1,635	
Chesaning	1,244	
Clare	1,326	
Clinton	1,038	
Coleman	1,014	
Constantine	1,226	
Corunna	1,510	
Decatur	1,356	
Dundee	1,118	
East Jordan	1,205	
East Tawas	1,736	
Elk Rapids	1,350	
Essexville	1,639	
Evart	1,360	
Frankenmuth	1,100	
Frankfort	1,465	
Fremont	1,331	
Gaylords	1,561	
Grayling	1,517	
Harbor Beach	1,149	
Harbor Springs	1,643	
Hart	1,134	
Hartford	1,057	
Hermansville	1,500	
Holly	1,419	
		12,180
Homer	1,097	
Howard City	1,398	
Imlay City	1,122	
Jonesville	1,367	
Kalkaska	1,394	
Lake Odessa	1,037	
Leslie	1,114	
Lowell	1,736	
Mancelona	1,226	
Manchester	1,209	
Marcellus	1,025	
Michigamme	1,200	61
Milan	1,141	
Milford	1,108	
Morenci	1,334	
Muskegon Hts	1,012	
Nashville	1,164	
Newago	1,172	
		480
Newberry	1,015	
Northville	1,755	
Onaway	1,204	
Ontanagon	1,267	
Opeckee	1,700	
Oscoda	1,109	
Ovid	1,293	
Oxford	1,172	
Paw Paw	1,465	
Pentwater	1,061	
Plainwell	1,318	
Plymouth	1,474	
Portland	1,874	
Quincy	1,563	
Reading	1,096	
Republic	1,275	
Richmond	1,133	
Riverrouge	1,748	
Rochester	1,535	
Romeo	1,580	
Sebewaing	1,243	
Shelby	1,081	
South Lake	1,000	
		863
Sparta	1,126	
St. Charles	1,317	
St. Louis	1,989	
Stanton	1,234	
Tawas City	1,228	
Trenton	1,167	
Union City	1,514	
Vassar	1,832	
Vulcan	1,150	
Wakefield	1,191	
Wayne	1,361	
Westbranch	1,412	
Westend	1,200	2,375
Whitehall	1,481	975
Williamston	1,113	480
Yale	1,125	863
Zeeland	1,326	57
Zilwaukee	1,000	
	137,367	

Over 500 under 1,000

TOWNS		Proposed Plant
Name	Popul'n	Acc't
Almont	718	
Armada	863	
Ashley	617	30
Athens	583	70
Augusta	541	15
Bancroft	528	10
Bark River	700	½m.
Berrien Springs	808	
Blackriver	525	
Boyne	912	100
Brighton	781	
Brown City	60?	
Burroak	744	
Capac	547	
Carson City	906	
Cedar	700	
Cedar Springs	950	
Centerville	645	
Champion	700	
Chassell	700	
Clio	640	
Coloma	687	
Colon	600	
Concord	538	
Coopersville	660	
Croswell	751	
Davison	781	
Dearborn	844	
Dexter	900	
Dollar Bay	578	
Edmore	642	
Eloise	700	
Elsie	576	
Empire	609	
Farmington	536	
Farwell	535	
Flushing	900	
Fowlerville	946	
Galesburg	689	
Glennwood	999	
Goblevile	505	
Grasslake	648	
Grosse Ile	500	
Grosse P't Farms	817	
Halfway	800	
Harrison	647	6,090
Jacobsville	500	
Laingsburg	690	
Lake City	816	
Lawrence	598	
Lawton	942	
Lexington	619	
Linden	543	
Litchfield	645	
Luther	837	
Lyons	656	
McBain	709	
Macinac Island	665	61
Mackinaw	564	
Manton	895	
Maple Rapids	575	
Marion	741	
Mariette	996	
Mass	750	
Mayville	825	
Memphis	586	
Mendon	777	
Middleville	829	240
Millington	638	
Montague	998	
New Baltimore	922	
New Buffalo	629	
Northbranch	654	
North Muskegon	513	
Olivet	800	
Omer	525	
Orion	756	
Palmer	799	
Pequaming	515	
Perry	641	
Pigeon	506	
Pinckney	500	
Pinconning	729	
Rapid River	600	
Ready	500	
Rockford	711	
Rogers	544	
Rose City	500	
Saline	584	
Sanilac Center	578	
Saranac	768	
Saugatuck	707	
Schoolcraft	859	
Scottville	554	
Seney	500	400
Shepherd	635	
South Lyon	657	
Spring Lake	696	
Springport	559	
Stambaugh	695	
Standish	895	
Stockbridge	677	
Takonsha	573	
Thompson	827	
Thompsonville	893	
Three Oaks	994	
Utica	562	
Vermontville	684	
Vernon	536	1,150
Vicksburg	972	487
Watervliet	717	240
Wayland	619	400
White Cloud	595	23
White Pigeon	705	
	79,323	

TO THE PEOPLE OF MICHIGAN:

The shameful failure and default of Bell Co. of Michigan and the consequent loss of $1,312,700 belonging to 747 minority and innocent stockholders should warn every honest and patriotic citizen to shun the New Bell Company, and then to resolve to support only the real Independent companies of the State.

HISTORY OF THE BELL MONOPOLY.

1876-1877	It wrongfully got patents. (See November "Telephony.")	
1878	Formed National Bell Telephone Co. Capital	$700,000
1879	It acquired the W. U. T. Co.'s Edison patents and telephone plants; and the W. U. Co. and the Bell divided the earth.	
1880	The N. B. T. Co. sold 500 shares at $600 a share, and then gave its stock holders 6 shares for one and then turned the Company over to the American Bell Telephone Company for	$6,500,000
1880	The Am. B. Co. increased its stock to	7,350,000
1881	The Am. B. Co. thus had then watered stock, at least	5,000,000
1881	The Am. B. Co. had, of real capital, no more than	2,350,000
1881	It had 47,880 telephones—costing about $50 per telephone (may be).	
1886	It had paid royalties to W. U. Co. to amount of	6,910,334
1894	Date of expiration of Bell's patents it had 237,186 telephones. *These 237,186 telephones represented 16 years of monopoly. Everyone knows that, until competition set in, the Bell did not wish the residence business. It hated it then, and it hates it now.*	
1894 to 1901	The Bell, under competition, increased its telephones to	800,880
1900	It watered its stock (changing over to A. T. & T. Co.)	$25,896,300
1901	The A. T. & T. Co. had watered and increased up to	94,237,500
1902	The A. T. & T. Co. had watered and increased up to	152,858,400
1894 to 1901	**The Independents had come from not ing up to 1,200,000 Telephones.**	
1901	**The Independents defeated the Bell's Berliner and Carty patents.**	
1903	The W. U. Company got a decision against the Bell for	$ 18,000,000
1903	The A. T. & T. Co. authorized an increase up to	250,000,000
1902	The Michigan Bell Co. had bonded debt	5,000,000
	Detroit T. Co. bonds assumed	600,000
	Floating debt unsecured	2,400,00
	Capital stock	5,000,,00

Michigan Independents had driven it to the wall.

The parent Bell had only $110,400 of the capital. It abandoned its child, leaving it to bankruptcy and suicide. (See W. A. Jackson's statement).

The annexed account is a standard one.

In each town the account would serve for *new plants.*

I believe that we will have to come to these rates and to an eight per cent dividend.

When the Independent Companies combine their toll lines—then indeed will the Bell be desperate.

So we are forming the Rogers Telephone Company for Michigan—(as in Iowa and Illinois we have formed Rogers Telephone Companies).

We shall operate my inventions in the interest of the Independents. We have selected our Michigan partners and now are settling the details.

We are getting in some of the very best men in the state—and among them will be some telephone men, as representative in Michigan, as are Ed. Hurmence, Vic. Stevens and J. H. Shoemaker in Iowa.

We have been warned of the method the Bell Company has adopted to meet our efforts—and we are going on deliberately and safely. *The Bell Company cannot buy nor can it appropriate my inventions. It will need all its time to keep alive in Michigan.*

We are making a record of tests and demonstrations that cannot be denied.

It is tiresome for me, (and expensive), to reiterate these declarations—but for the sake of a record I must keep on. Every month we are farther and farther away from the chance of any contest. When I commenced the advertisements in Telephony nearly every expert howled against the Automatics. Now every one, having a face to save, is yelling his support of some kind or another of Automatics.

When I commenced, one really able telephone engineer, for instance, said he would not believe it even if he saw us telephoning directly, from a dynamo.

Now even some Bell engineers regard the issue as a serious one—and many Independent Telephone men, and many scientists believe that I can do all that I have claimed. Nearly every day we are making friends and converts. *The telephone business is the least of the applications of my inventions.*

Some day everyone will know this—and then will see how sure and easy the telephone part is.

If the Michigan Independents will get together on their toll lines—the Bell will practically be out.

We have showed some Iowa Independents how to get together. Other Iowa Independents will quit making faces and will come in. Look over these matters, and get together, with or without the Rogers Telephone Company.

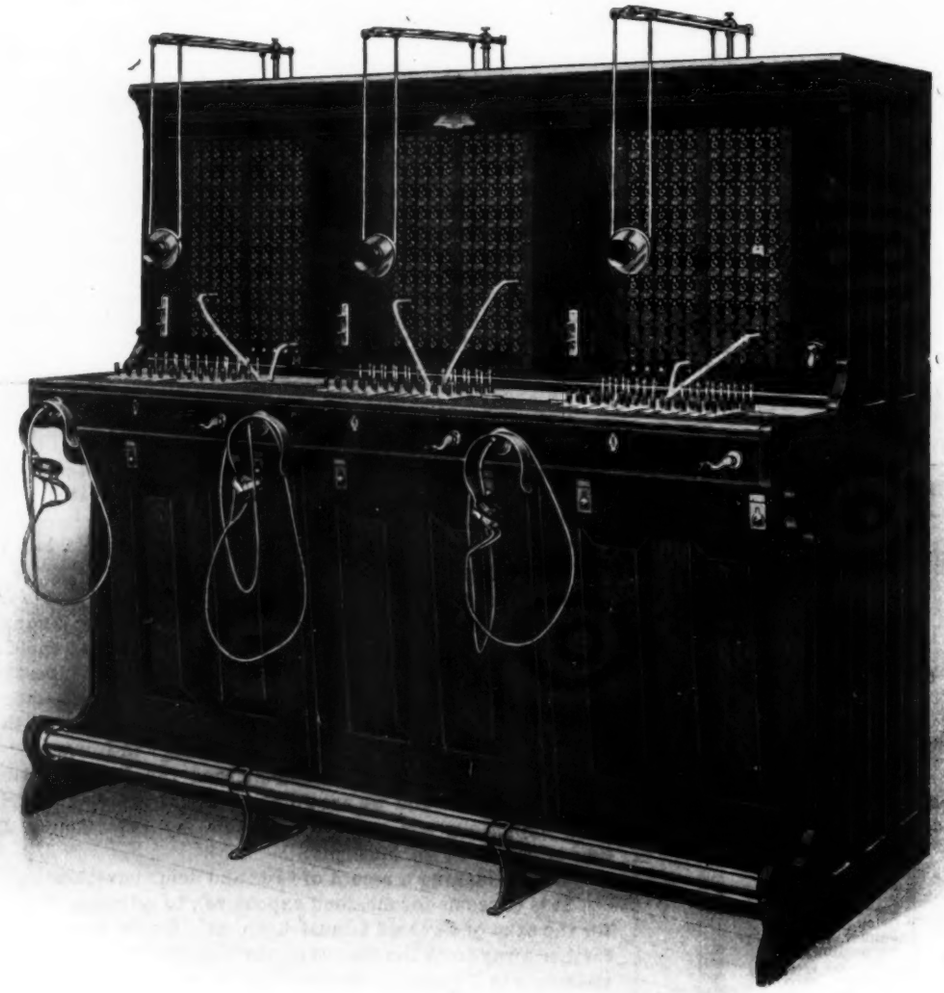
OSCAR WENTWORTH ROGERS

New York, Nov. 20, 1904.

XUM

Kellogg Telephone Apparatus

Every part of our product, down to the smallest detail, built on the most improved scientific and practicable principles



KELLOGG EXPRESS TYPE SWITCHBOARD.

The fact that our very first telephones and switchboards are still giving absolutely satisfactory service to-day is conclusive proof of their excellence

Kellogg Switchboard & Supply Co.

Green and Congress Streets. Chicago

Seymour Building
Los Angeles

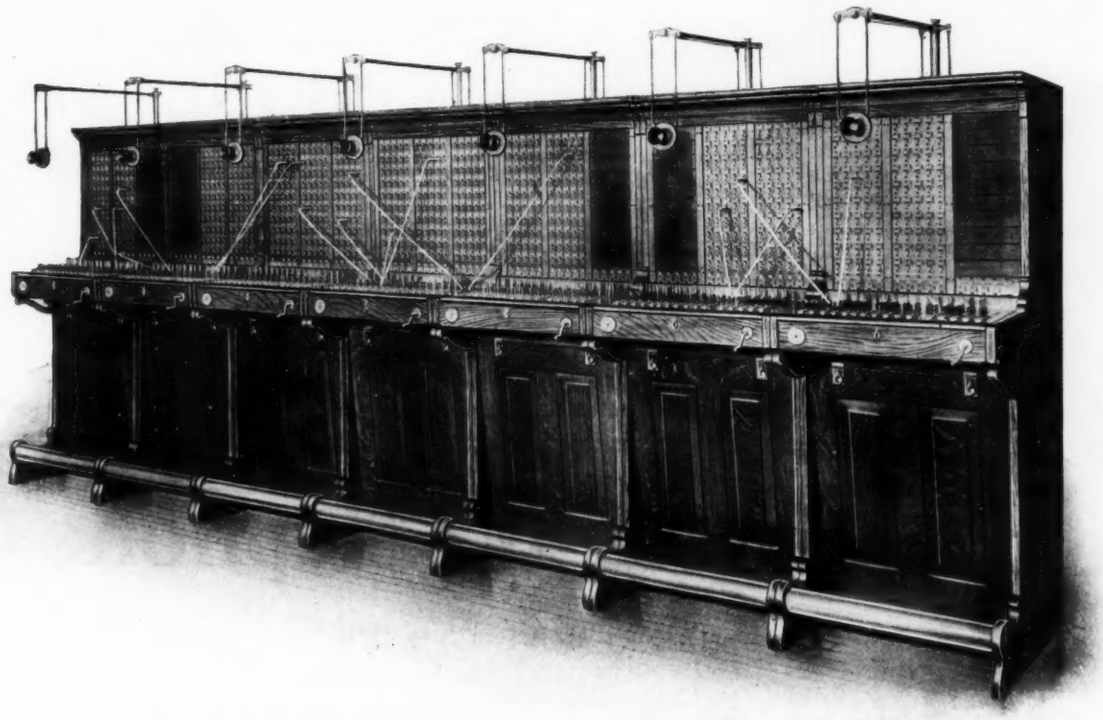
Electric Building
Cleveland

Keystone Telephone Building
Philadelphia

Please tell the Advertiser you saw his Announcement in TELEPHONY.

The Kellogg Principle

To manufacture the very finest and best telephones and telephone accessories that ingenuity and money can produce. Nevertheless, Kellogg Apparatus is less expensive than any other make when cost of maintenance and superior efficiency are considered.



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This cut illustrates the simplicity of our system of increasing a switchboard of the magneto type from one unit to as many as desired—without changing equipment in any way and still having the most efficient service. Each section is provided with the most complete and up-to-date lamp transfers on the market. The Kellogg Telephone Systems and Apparatus have the second time received Highest World's Fair Award—THE GRAND PRIZE—this time at the St. Louis Exposition. Write for our catalogues.

Kellogg Switchboard & Supply Co.
Chicago

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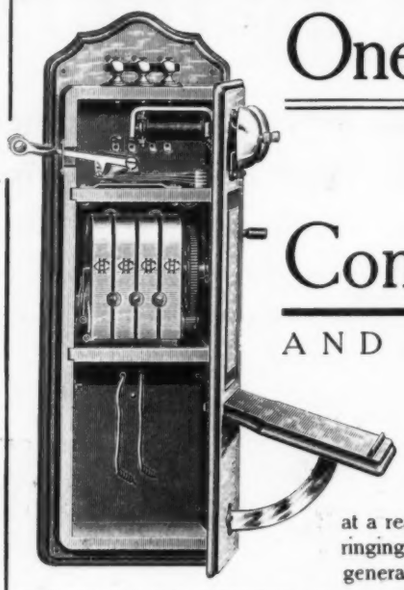

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DO YOU KNOW THAT
YOU CAN BUY THIS

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at a reasonable cost. ¶ Pure platinum contacts on both ringing and talking circuits. ¶ Equipped with those H-C generators and ringers. Write us.

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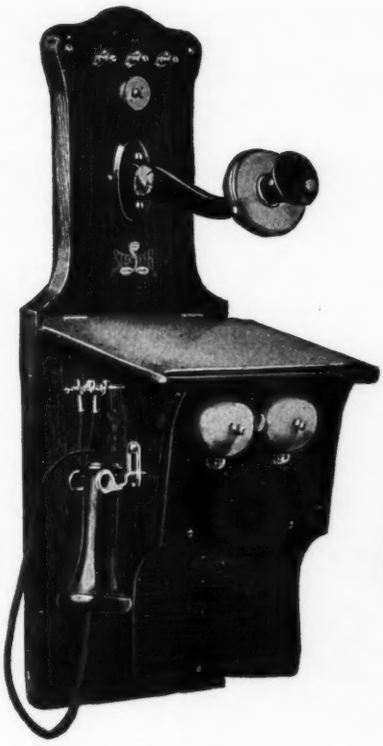
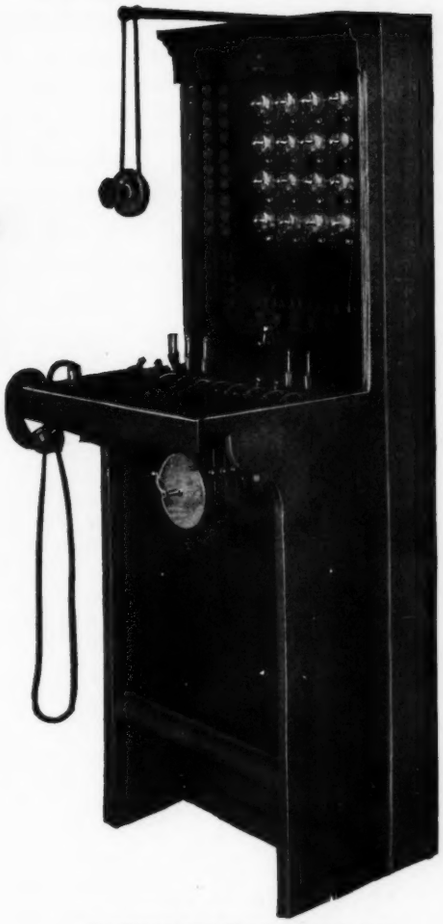


No. 118.

Compact Type
Golden Oak
Made any resistance
Use any number on a line
Satisfactory service guaranteed



Sectional Board with Drops and Combined Drops and Bells.

No. 18.

Compact Type
Golden Oak
3, 4, or 5 Bar Generator
Long Distance Transmitter
Bipolar Receiver with Heavy Rubber Shell
All Contacts Platinum
Self-contained Hook

Our sectional type switchboards with or without Combined Drops and Bells have no equal for small exchanges. The Drops can be added in strips of ten as needed — this strip is complete with jacks and cord circuit.

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Write to-day for free copy of our mammoth protector catalog.

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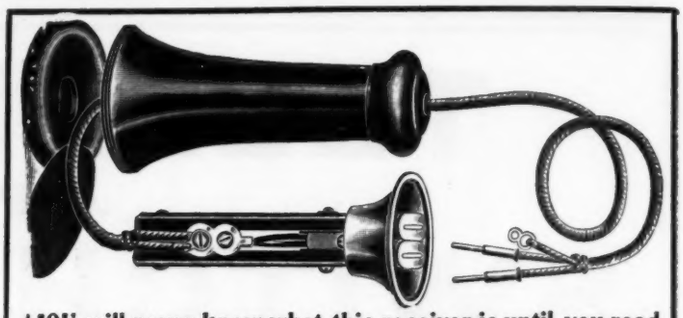

YOU will never know what this receiver is until you read our descriptive circular which we will send on application

Novel Features Combined with Best Workmanship, at a fair price. Write

SPIES ELECTRIC CO., Mfrs., 81 W. Van Buren St., Chicago, Ill.

BETTER! That's It! BETTER!

"Everything Electrical"

"WESCO" telephones are **better** than you can buy at **any** price. If you doubt it, we will send you one on trial, and if you are not convinced after you have used it 30 days, tested it, and compared it with all others, return it at our expense, and it will cost you nothing. Our name is a guarantee of quality and service, and our guarantee is without a time limit.

"Everything Electrical"

THE WESCO SUPPLY CO., St. Louis, Mo.

Edward E. Clement

ATTORNEY AND COUNSELOR IN PATENT CAUSES

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Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

VOL. VIII. CHICAGO, DECEMBER, 1904. No. 6.

A Growing Independent System

FRANCIS E. DWIGHT

THE Citizens' Telephone and Telegraph Company of Kenosha, Wisconsin, is a splendid example of an aggressive, up-to-the-minute, successful Independent telephone company. It has been in existence less than a year, but in that comparatively brief space of time it has accomplished more for the cause of telephony in the city of Kenosha than the Wisconsin (Bell) Telephone Company can claim for the score of years it has been in operation there. Its modern methods of doing business and its most excellent service have been a revelation to the people of that city, who had become so accustomed to Bell methods and the antiquated system of the Bell company that they had resignedly accepted the telephone situation of the place as their eternal lot and took whatever was offered them; but not, however, without complaining. The logical sequence of conditions at Kenosha was the Citizens' Telephone Company, which appeared on the scene in the role of a deliverer, and its steady growth and great popularity from the first not only attest that it is fulfilling its mission, but also bespeak highly gratifying financial conditions.

HOME OF THE CITIZENS' TELEPHONE AND TELEGRAPH COMPANY, KENOSHA, WIS.

Where ten months ago Kenosha had one totally inadequate and altogether unsatisfactory telephone system, now it has as fine an Independent plant as is to be found in any city of 15,000 population in the country, and the introduction of competition into the situation has resulted also in somewhat improved service on the part of the Bell.

So much for what the Independent movement has done for Kenosha in less than a year. And only a beginning has been made, so declares the management of the Citizens' company.

While the readers of TELEPHONY are, in a measure, familiar with the history and rapid growth of this model Independent system, a detailed description of the plant—its equipment, progress, present condition and future prospects—will prove interesting and may be perused with profit by all. The Citizens' Telephone and Telegraph Company of Kenosha was organized in 1902, incorporated under the state laws of Wisconsin, with a capital stock of $50,000, and with the following officers:

President, Geo. A. Yule; vice-president, William F. Fisher; secretary, John H. Corcoran; treasurer, Charles C. Brown; directors, George A. Yule, James Cavanagh, N. J. Werner, H. B. Robinson, C. A. Dewey, J. A. Pitts, Chas. C. Brown, William F. Fisher, John H. Corcoran.

It was believed by the original promoters of the Citizens' company that if it ultimately succeeded in securing a list of 400 or 500 subscribers, at the outside, it would be scoring a remarkable achievement, but that they builded better than they knew is shown by the fact that at the present time, after having been in operation only ten months, the company has nearly 1,000 subscribers, and the list is being added to at the rate of 100 a month. No more flattering or emphatic testimonial to the popularity of the methods and

superior service of the Citizens' company could possibly be offered.

The designing of the Kenosha plant, including every detail of buildings and equipment and the execution of all work, was in the hands of James E. Keelyn of Chicago. Mr. Keelyn was assisted by W. G. Peacock, engineer; C. E. Egan, superintendent; George J. Newton, installation expert, and E. Schwartz, mechanical expert. The plant was finished in January of the present year, and the first telephone was installed on February 6. The company started operation on March 1 with nearly 400 telephones connected up, and the service from the first was of a highly satisfactory nature to the patrons, so much so in fact that orders for new telephones to be installed came in at an unexpected rate and far more rapidly than the company could fill them. This condition also exists at the present time, and there is every reason to believe that it will continue indefinitely, or until every business place and residence in Kenosha is supplied with a Citizens' telephone.

In its operations in Kenosha the Citizens' company has taken for its slogan, "Telephone service for all the people — the laborer, mechanic, clerk, accountant, farmer, salesman, merchant, banker, manufacturer, and their wives, as well as their neighbors' wives and children." This unique statement appears on all the advertising of the company, and the phrase, "Telephone service for all the people," is to be heard all over the city in connection with mention of the Citizens' company; and be it said to the credit of this company that this mention is rarely other than of a complimentary character.

MAIN SWITCHBOARD CITIZENS' TELEPHONE AND TELEGRAPH COMPANY.

The company has twenty employes on its pay-roll, including eight wide-awake and obliging operators. Miss Maud Brogan is chief operator and Miss Ella Tanck toll operator.

The Kenosha plant comprises about 800 miles of wire on cross arms, 1,000 miles of wire in aerial cables and 2,500 miles of wire underground cables. National cable of conference specifications is used. All distributing poles are equipped with "Western" circles, terminal heads and special platforms. The underground cable is mostly 200-pair, and the multiple system of distribution is used.

The line construction is of the composite style. The central part of the city and all main leads are of underground construction, brought out to terminal distribution in the center of each block. About 200,000 feet of underground conduit has been laid. The conduits are of the American Conduit Company's product and are laid in concrete throughout. Manholes of concrete, iron-capped, are provided at all street and alley intersections, anticipating future requirements of 3,600 subscribers.

From the underground district to the suburbs the larger part of the city is supplied through aerial cables, which lead upon lines of Michigan white cedar poles, forty to sixty feet in height, painted and stepped throughout. The suburban and outlying districts are covered by overhead wires of the best B. & B. galvanized iron. All wires passing through trees, as well as surface wires, are of heavily braided rubber insulation. All cross-arms are ten-pin yellow pine, weather treated. All pins are locust, and double-grooved pony glass insulators are used except where transpositions are made.

On the question of exchange equipment it was decided to install the new Western combination switchboard, which allowed putting in a full central energy lamp signal, two wire multiple circuit switchboard, manufactured by the Western Telephone Manufacturing Company. This switchboard is a radical departure from those commonly used. Frame capacity and partial installation is for 2,400 lines, and complete installation is made for 1,000 lines. The switchboard is so arranged that any operator can make direct connection with 1,000 lines without trunking or multiple. An increase of 2,000 lines means the addition of a duplicate section and only one set of multiples. Each operator's position is equipped with fifteen pairs of cords and plugs, double supervisory lamp signals, fifteen ringing and listening keys, for selective signaling, one special breast transmitter and head receiver, pilot lamp, etc. The switchboard frame is of steel, strongly braced; cabinet work is of mahogany, made in a highly artistic and substantial manner. From the first this switchboard has operated in a highly satisfactory manner. Beside meeting every requirement, it has saved the company about one-half in the cost of operators, which is a considerable item in the operation of any exchange. Where with an ordinary switchboard twelve operators would have been required, by using the Western Telephone Manufacturing Company's combination switchboard, the company has had to employ only half that number.

A 100-capacity toll board of the same material and finish as that of the main switchboard is located in the operating room. The toll board is equipped for fifty magneto and fifty common battery lines together with the necessary trunks connecting to the main switchboard. Advanced ideas in the art of toll equipment are apparent in the construction and operation of this board. Drops are of the generator-call, relay type, capable of repeating any number of calls, clear-outs are of the lamp-signal pattern operated by generator ring-off and are more positive and reliable than the old style of drop clear-outs. Selective keys designed for

Wire Chief's Desk and Generators.
Power Board.
Circle Top Distribution.
Pole Lead.
Intermediate and Protector Racks.
Manager's Office.
Monitor's Desk and Toll Switchboard.

INTERIOR AND EXTERIOR VIEWS OF THE KENOSHA EXCHANGE.

XUM

four, eight and twelve party service add to the completeness of the equipment.

In examining the central office equipment, and especially the main switchboard, surprise is occasioned at the simplicity and compactness of the apparatus used in accomplishing results that usually require the use of switchboards four times as large in caliber, and three to eight times as many spring-jacks.

In the terminal room is located the main distributing board, intermediate rack, wire chief's desk, complete with testing apparatus. The main and intermediate rack are both of the American Electric Fuse Company's type and are equipped with protectors for heavy and sneak currents and lightning. Protectors are of the self-soldering type.

The storage battery equipment consists of duplicate sets of special Porter batteries of sufficient capacity for a 3,000-line switchboard. The power switchboard is of pure white marble mounted on an iron frame, and is completely equipped with Weston flush type ammeter and voltmeter, automatic over-load and under-load, circuit breaker, fuses, buss-bars, rheostats, starting boxes and all necessary switches, the latter being of the Crouse-Hinds tubular arm type. The power plant contains Wagner single-phase motors direct connected to Roth type generators. Duplicate ringing machines of the Roth type, complete with busy back, howler, and pulsating attachments, are also installed, as well as a Holtzer-Cabot ringing generator for four-party lines in the city, of which the company has many.

Every detail of this system shows up to the highest advantage and no expense has been spared to make it first-class in every particular. The apparatus throughout was supplied by the Western Telephone Manufacturing Company, and the entire construction and installation was made under contract with the new Western Telephone Construction Company.

The Citizens' company is housed in a fine three-story brick building in the business center of the city, occupying nearly the whole of the third floor. The different departments are neatly appointed, and nothing is lacking that should go to make up a high-class telephone exchange run on up-to-date lines by enterprising business men.

The exchange has toll connections with the following places: Racine, Bristol, Pleasant Prairie, Paris, Union Grove, Trevor, Brighton, Somers, Wheatland, Salem, Kansasville, Fuller, Wilmot, Silver Lake, Spring Grove, Hickory, Milburn, Wadsworth, Lambs Corners, Lake Villa, Grayslake, Gurnee, Russell, Druce Lake, Antioch, New Munster, Ives Grove, Corliss, the Heidersdorf-Kreuscher line, and Winthrop Harbor, Illinois. The only way the 700 subscribers in these places can be reached is through the Citizens' Telephone and Telegraph Company, and no other company can connect its patrons with half as many subscribers in Kenosha and Racine counties as can be reached through this company.

In addition the Citizens' company has toll connections with the Citizens' Telephone Company of Racine and its 2,200 subscribers, the two companies working hand in hand in the matter of furnishing ideal telephone service, and incidentally in furthering the Independent cause in Wisconsin. In a few days toll connections will be established with the entire northern part of the state by the building of a stretch of thirty-five miles of line between Corliss and Elkhorn, which will put the Citizens' company in touch with the numerous exchanges in the widespread system of the Badger State Telephone Company, which includes Madison, Beloit, Janesville and Elkhorn—in all about 20,000 telephones. This connection also will take the Citizens' company to Rockford, Illinois, and through the exchange in that city will give it connections with the Inter-State Telephone Company and its thousands of subscribers in northern Illinois. This addition of toll-line facilities will be a great boon to subscribers of the Citizens' company and will further enhance the value of the plant.

As bearing upon the success of the Independent movement in Wisconsin, it may not be out of place to here mention a few words about the Citizens' Telephone Company of Racine, which, because of its close business relations with the Kenosha company, is looked upon as a sister organization, and particularly as the success of the former is being repeated by the latter. The Racine company started business three and one-half years ago on a capitalization of $50,000. Its success has been little short of phenomenal, as at the present time, in a city of 35,000, it has 2,200 telephones installed, the capacity of the plant being entirely exhausted—a condition that the original promoters in their most sanguine moments of expectation would never have dared hope for, much less have expected to come to pass. With the plant taxed to its full limit and unable to install another telephone, hundreds of Racine residents are petitioning the Citizens' company for service, the Bell company practically having been eliminated from the field in Racine, as undoubtedly will be the case in Kenosha within the next two years.

In order to meet the popular demand for its service, the Citizens' company of Racine will set about at once to double the capacity of its plant, and to accomplish this the directors have authorized an issue of $200,000 five per cent bonds. Of this amount $50,000 will be used to take up the original issue of $50,000 six per cent bonds, $50,000 will be used for the erection of a new exchange building and equipment, and the remaining $100,000 for the extension of the plant. As rapidly as possible new telephones will be substituted for the old, and it is the purpose that, by the time the extensions to the system shall have been completed, the plant will be practically new and thoroughly modern to the last degree. This achievement in the field of Independent telephony is all the more remarkable when it is taken into consideration that the Racine company is less than four years old; that it has never solicited a subscriber, and that what business has come to it has been voluntarily tendered by the public.

The truth of the matter is, that the Racine company has been so busy taking care of new business it has had no time to solicit subscribers. Now, however, a force of solicitors will be put in the field, and it is confidently expected that eventually the plant will be brought up to its maximum power, and will furnish service to 5,000 subscribers in Racine and vicinity. The company has paid dividends from the first, and the directors have been importuned for stock in the company, but the answer was always the same, "We have none for sale." As regards the $200,000 bond issue which the company will make, the remarkable condition obtains of practically every dollar of the amount being subscribed before the stock is ready for delivery. William Van Middleworth is manager of the Citizens' Telephone Company of Racine, and has contributed largely to its success.

Kenosha is analagous to Racine insofar as their Independent telephone systems are concerned, as the history of the Citizens' company of Racine is being repeated by the Citizens' company at Kenosha, although the exchanges are under entirely different managements. It is as certain as anything can be without being an accomplished fact, that within two years the Kenosha plant will have fully 1,800 subscribers, as its service is conceded by all of its subscribers to be superior in every way to that furnished by the Bell. The plant is undercapitalized and there is no stock on the market at the present time. After the first of January, it is stated, a limited amount of the stock will be offered for sale in Kenosha.

The company recently had printed a circular, offering certificates of its capital stock for sale at par, but none of the circulars was distributed, as it was decided by the directors, in view of the rapid progress being made by the company

and its bright financial future, to delay the offering of its bonds until the first of the coming year, when the plant will be on a dividend-paying basis, and then to sell none of the stock at less than par and accrued interest. The text of the circular follows:

We are pleased to announce that the telephone exchange and telephone system of the Citizens' Telephone and Telegraph Company is in complete operation with a full corps of experienced operators in charge of the operating department; that we are now furnishing the broadest and best service ever given in Kenosha, and that it is confidently expected that this exchange will have installed 2,500 telephones in the city and county of Kenosha. We now have direct toll line connection with 700 country subscribers, and shall also have 3,500 telephone subscribers in Racine city and county within the next three years, making in all over 10,000 subscribers—a breadth of service five times as great as ever before available through any other source in these two counties.

This company was organized with the idea of interesting local capital, and this purpose has not been abandoned, but held in abeyance in order to fully demonstrate the completeness and practicability of the enterprise and its profit-earning power to stockholders and all those who might desire to become interested in the company through the investment of money in its securities; that work has been done, and we are now in a position to place before the people a reliable statement of receipts and expenditures, showing beyond any question a very large surplus annually, after making every necessary outlay, and the payment of good dividends to the owners of stock. The entire issue of the capital stock ($50,000) of the company should be owned and held by its subscribers for service, citizens of Kenosha and vicinity who pay rental and toll, contributors to the prosperity of the company, who should dictate its policy, manage its affairs and share in its distribution of dividends. The company's charter runs fifty years, and the equipment and construction work furnish ample capacity for continuous development, and the interest of the company and the people of Kenosha and vicinity will be so closely identified that all may have a just pride in its continued success, and we do not hesitate to say that there are good reasons why this stock should be at a premium the first year, and we believe that with aggressive and economical management, in five years from this date it will be at a premium of fifty per cent, if not doubled in value.

We herein give an exhibit furnishing an estimate of receipts and expenditures for one year, showing the profit to the stockholder in dividends and the prospective enhancement in value of stock from year to year, with the continued increase of the company's surplus fund:

RECEIPTS.

CITY BUSINESS:

Rental from 1,200 telephones annually	$19,200	
Toll receipts—$10 per day	3,600	
COUNTRY BUSINESS:		
Rental from 300 telephones	3,600	
Total receipts for one year		$26,400

DISBURSEMENTS.

Current annual expenses	$ 7,000	
5 per cent interest on $50,000 bonds	2,500	
6 per cent annual dividends on $50,000 stock	3,000	
Annual sinking fund for bond redemption	2,500	
Total outlay for one year		15,000
Balance to credit of surplus account for one year		$11,400

We shall be able to satisfy any who may wish a safe and profitable investment for their money that the foregoing results may be secured. The subscription list will be increased to larger numbers and the toll income will undoubtedly be trebled in the near future, when additional toll connections and long-distance service are obtained, all tending to increase the general revenue with but a slight increase of current expenses. The large increase in the number of new buildings in Kenosha during the last year, and now under construction, together with the steady influx of population, gives abundant assurance of a greatly increased demand for a broader telephone and toll service.

At the same time we find by experience gained in the field that a great number of families and business places are asking for service that never before used it; also that every farmer who expects to compete with his neighbor, or to talk to him, will be compelled to have a telephone in his home and that all are reliable and prompt patrons.

It is the purpose of the builders and owners of this plant to continue in control of the company until such time as a board of directors and officers, composed of responsible and capable citizens of Kenosha, are elected to succeed the present management in the conduct of its affairs.

We are now issuing certificates of the capital stock. Each share is for $100 and may be had at par for cash, or on a cash payment and the remainder in deferred payments, the deferred payments to bear interest to maturity.

You are most respectfully invited to call at the company's offices, where we shall be pleased to give all desired information and satisfy you as to the value of this stock as a permanent paying investment.

The general manager of the Citizens' Telephone and Telegraph Company is J. W. Johnson, whose energy, tact and executive ability have had much to do with bringing the system up to its present high standard, where it is proving a success, financially and otherwise. He is ably assisted in this work by H. S. Pringle, assistant manager, a thoroughly competent telephone man and an indefatigable worker, who is alive to the situation and the telephonic needs of Kenosha.

The present officers of the company are:

President—A. E. Ziehme.

Vice-President—Charles L. Johnson.

Treasurer—Charles L. Johnson.

Secretary—H. L. Fearing.

Directors—A. E. Ziehme, C. L. Johnson, F. W. Pringle, G. Hallett Johnson, H. L. Fearing.

TELEPHONE COMPANY WINS.

In the district court at Kearney, Nebraska, Judge Hostetler handed down a decision in the injunction case of Randall & Company against the Farmers' Home Telephone Company of Shelton, Nebraska. The court found in favor of the defendant, dissolving the restraining order and ordering that each party pay his own costs.

In this case Randall & Company asked for an injunction to prevent the telephone company from taking its telephone from the plaintiff's store in the town of Gibbon, Nebraska, claiming that the defendant had threatened to remove same, and that such an action would result in great injury to the business of the plaintiff. A temporary restraining order was issued and the case was heard on its merits.

Defendant claimed Randall & Company had persistently violated the rules of the company by receiving messages over rival lines, and transmitting them over the defendant company's lines. The court held that the company had the right to make and enforce reasonable rules and to discontinue its service when the rules were not complied with.

The above ruling is very important to Independent telephone companies in various localities where local exchanges have been handling the business or doing the exchange work for rural lines that are owned by the farmers or mutual companies not directly interested in the local plants and which have been paying a stipulated amount for switching privileges. In this particular case there was a farmer line, consisting of twelve subscribers, owned and operated by themselves, and they wished connection with the town of Gibbon, where they did their trading, but didn't care to pay the nominal fee of twenty-five cents per month per telephone to the Farmers' Home Telephone Company, which owns and operates an exchange there; so in order to overcome the switching charges they got permission from the firm of Randall & Company to install a telephone in the latter's store, providing Randall & Company would transmit messages for them, which Randall & Company agreed to do, not only over the Farmers' Home Company's lines, but over the lines of the Bell company as well, for Randall & Company had one of the Bell telephones in their store. This was carried on for some time, until the Farmers' Home Company discontinued its service to Randall & Company, which brought about the suit.

The Owosso (Mich.) *Argus* says: "M. L. Izor has resigned as Bell telephone manager at Durand and the business has been turned over to Undertaker G. W. McLain. Is the business dead?"

XUM

Phases of Long Distance Telephony

SAMUEL G. McMEEN.

LONG-DISTANCE telephony as a practical commercial art is of relatively recent origin in comparison with the actual use of the telephone in business and social affairs. Telephone exchanges existed twenty-five years ago, but until the adoption of two similar wires for each circuit and the adequate treatment of circuits with relation to each other to prevent mutual interference, conversations at all to be called "long-distance" were limited to radii of twenty-five miles or so. By the use of two-wire lines, instead of one-wire-and-ground-return lines, successful talking over radii of a thousand miles or more has been possible and has been practiced for about twelve years.

The original telegraph lines laid and erected by Professor Morse were of two similar wires per line, and the early circuits copying after his, both in this country and abroad, were so arranged. Once upon a time, one wire of such a line in Germany, in breaking, fell with both its ends upon the earth and in reasonably good contact with it. The circuit continued to be a practical telegraph line even with this interruption of one of its sides, and the observation of Steinheil enabled advantage to be taken of the accident to the result of grounding these two wires immediately at the end stations. This resulted in the universal adoption of one wire

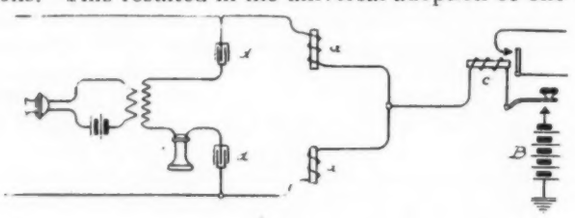


FIG. 1.

and a ground return for all telegraph purposes, and it was only natural that such circuits, having become universal for telegraphy, should be adopted for telephony when the latter made its appearance immediately after 1876.

But grounded circuits for telephone purposes suffered greatly from mutual induction, styled "cross talk," and had the further disadvantage, if of a few miles' length, of suffering from strange and disturbing noises from electrical changes from instant to instant in the atmosphere and in the earth. These sounds had some interest from a physical point of view, as they were so unlike sounds ordinarily met in life that they seemed to point to a possibility of a useful study of weather and other conditions of the earth. Practically, however, they were a great obstacle to successful telephony, and their abolition by the use of the two-wire line, or metallic circuit, made a distinct new progress possible.

The early wires were all of iron or steel, copper being unsuitable because of its tendency to stretch and then to break. When it was made possible to draw wires of copper in such a way as to provide a strong, hard outer surface, bare line wires of sufficient strength and economical smallness were available, and two such wires formed, and still form, the highest type of long-distance telephone circuit.

SIMULTANEOUS TELEPHONY AND TELEGRAPHY.

The cost of the path over which talking may be done between points widely separated is so great, for a variety of reasons, as to prevent a wholesale use of so valuable an aid. A principal reason why the investment cost reacts upon the consumer of the service is that the circuit is available for personal conversations during only such hours as the people furnish the work to be done, and a considerable reward always has awaited an arrangement which would utilize the idle time of these expensive circuits in any way allowing by-product values to be secured. The only way which has been found so far is that of utilizing the wires of the telephone circuit for the purpose of telegraphy, as well as for transmitting actual speech, and this has been

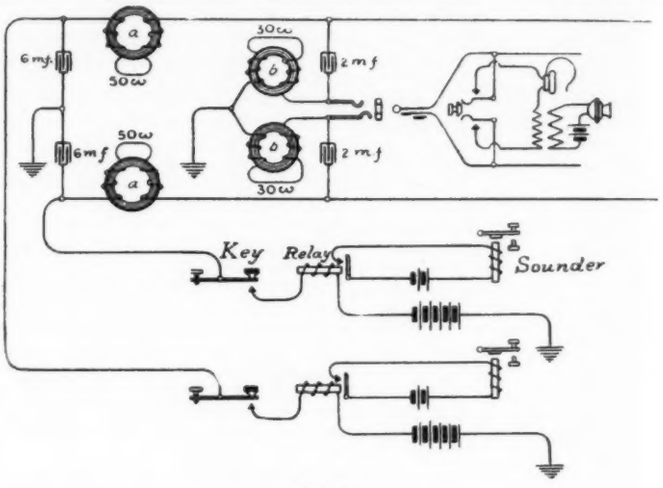


FIG. 2.

accomplished by taking advantage of the very considerable difference in the frequency of telegraphic currents and actual voice currents.

Van Rysselberghe of Belgium has made the largest contribution to this art. It is a development of his system which utilizes each wire of a circuit for telegraphic purposes, whether it be or be not used for talking at the same time as well. A simple form of simultaneous working, quite rightly named "Simplex," is that illustrated in Fig. 1, and provides

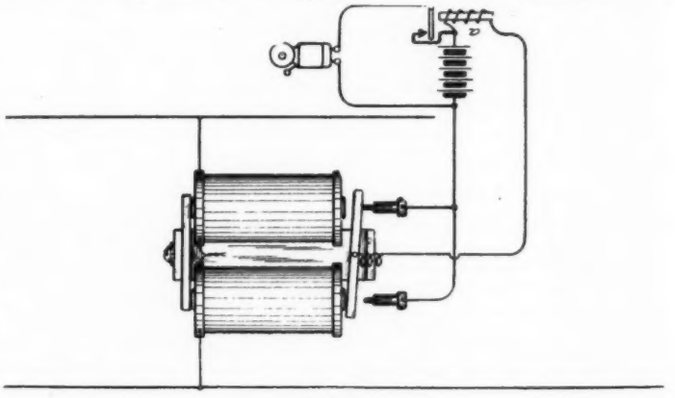


FIG 3.

one telegraph circuit from each metallic circuit telephone line. Broadly speaking, this circuit is not dependent upon a considerable difference in the frequencies of the telegraphic and speaking currents, but only upon the fact that the telegraphic current passes over both sides of the line in the same direction at the same time, while the speaking currents circulate in the metallic circuit as such. Simultaneous potentials on the two sides of the line naturally prevent any sounds from the telegraph appearing in the telephone circuit. The coils *a* and *b* are inductive ones, and through them equal

currents pass to the two telephone wires in parallel, each current being half of that from the batter *B* through the relay *c*. An arrangement quite similar, at the distant end of the line, receives the telegraph signals. Variations from this type exist in the use of repeating coils stead of impedance coils, and a variety of arrangements can be suggested by anyone familiar with both the telegraphic and telephonic arts. In any such arrangements the condensers *d* are not essential, but have certain minor values.

The contribution of Van Rysselberghe has led to the possi-

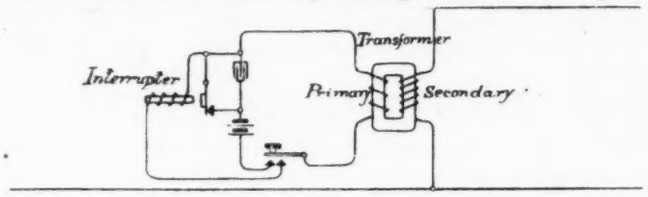


FIG. 4.

bility of utilizing a metallic circuit not only for telephony, but for *two* independent telegraph circuits as well. Fig. 2 illustrates one of the forms widely used for such purposes. It being understood that the distant stations are quite duplicates of those shown in Fig. 2, a little thought will make plain how the two things can go on at the same time without interference. This will be easier when it is remembered that the condensers shown are relatively transparent to alternating currents and opaque to direct currents. Also that the choke coils *a*, while they have each two windings upon the ring core, have those windings connected in the familiar differential or reversed relation to each other. So far, therefore, as direct currents are concerned, the magnetizing effort of one winding of each such coil *a* neutralizes that of the other; and this is true for direct currents even if interrupted at the highest frequency existing in telegraphy when dots are being sent by hand in rapid succession; but for such high-frequency currents as those of speech and of such small volume, the windings of the coils are practically two independent choke coils in series, offering a maximum inductive barrier.

The choke coils *b* are wound with their windings inductively related, and provide a maximum choking effect. The telegraph apparatus shown is of the usual familiar type, involving a key to be worked by hand, a relay and a sounder. Quite the usual possibilities with reference to the formation of very long telegraph circuits by the use of repeaters are available with these systems, and for the reason

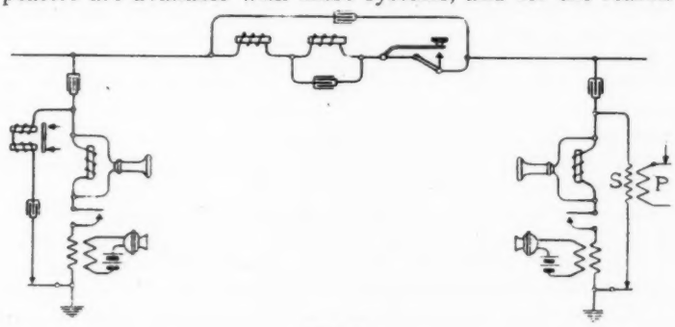


FIG. 5.

that the telephone side of the problem requires long wires of the best known commercial conductor, copper, the telegraph results are excellent.

The foregoing are problems of making telegraphy a by-product of telephony. With so many telegraph wires on poles over the country, it has seemed a pity not to turn the thing around and provide for telephony as a by-product of telegraphy. This has been accomplished, although for the reason that the telegraph circuits are not in pairs, accurately matched one wire against another, and are far from being uniform as to material, it has not been possible to secure as good telephone circuits from the telegraph wires as telegraph circuits from the telephone wires.

The thing which has enabled practical results to be secured is an adaptation of the original principle of different frequencies. A little further study of Fig. 2 shows that over such a composite circuit the usual method of ringing from station to station over the telephone circuit by an alternating current of a frequency of about sixteen is practically impossible. This is because of the heavy short-circuit provided by the two choke coils *b* at each of the stations and the heavy shunt of the large condensers. If high-frequency speech currents can pass over these circuits with a very small loss, other high-frequency currents should find a good path. There are many easy ways of making such currents, but formerly none very simple for receiving them. Fig. 3 shows one simple observer of such high-frequency currents. It is merely an adaptation of the familiar polarized ringer used in every subscriber's telephone. In either position of the armature it makes contact with one or the other of two studs connected to the battery, so that in all times of rest the relay *a* is energized. When a high-frequency current passes through this polarized relay, however, there is enough time in which the armature is out of contact with either stud to reduce the total energy through the relay *a* to allow its armature to fall away. This may ring a vibrating bell or give any other convenient signal.

Fig. 4 shows a form of apparatus for producing the high-frequency current necessary for signaling. It is evident that

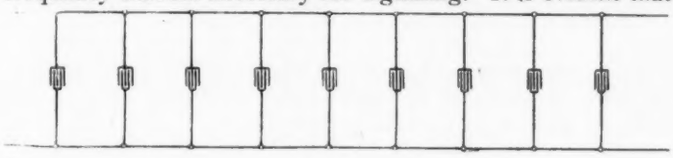


FIG. 6.

if a magneto generator, such as was formerly used in ordinary telephones, could be made to drive its armature fast enough, it also might furnish the high-frequency current necessary for signaling through condensers and past heavy impedances. The arrangement in Fig. 4 is little other than an automobile jump-spark coil, and serves its purpose admirably.

Applying these principles of high-frequency signals sent and received to a single-wire telegraph circuit, the arrangement shown in Fig. 5 results. The principal points of interest herein are the insertion of impedances in series with the telegraph lines, the shunting of the telegraph relays by small condensers, the further shunting of the whole telegraph mechanism of a station by another condenser, and thus keeping out of the line circuit changes in current values which would be heard in the telephones if violent, and might be inaudible if otherwise. A further interesting element is the very heavy shunting of the telephone receiver by means of an inductive coil. The alternating current sending and receiving devices will be recognized in this figure also.

In telegraphy over land lines, that is, lines across country or in the air, the two things which particularly limit the distance over which communication is possible are the resistance of the wire and the insulation of that wire from others and the earth. In quadruplex and other multiplex systems of telegraphy aiming at the transmission of more than one telegraph message over a wire at the same time the effects of the electrostatic capacity of the wire begin to be noticed. These capacity effects are most noticeable in very high-speed telegraphy, but not so greatly in the simplest forms of sending by hand.

In telephony, however, the effect of the capacity between the two wires of a circuit becomes marked as soon as the line attains a length of a few hundred miles. In telegraphy repeaters can be used to start the signals on a new circuit,

XUM

and thus link by link a very long stretch can be covered. No one has invented a practical telephone repeater, so that whatever is possible in the way of applying improvements must be done by making the transmitters more powerful, the receivers more sensitive, or the line better able to carry the current without loss.

IMPROVEMENTS IN LONG TELEPHONE LINES.

In the laboratory one may build a line having a very considerable resistance, indeed, and talk over it successfully.

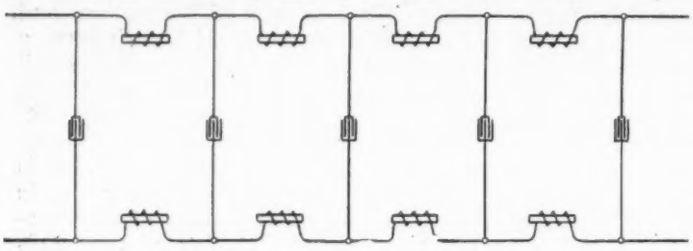


FIG. 7.

In actual practice one may build a line and insulate it very thoroughly, but there is no way of building a line in the air, in the earth, or under the sea in which the dimensions and spacing of the parts of the circuit will be at all reasonable without the resulting capacity between the two wires being large enough to absorb a very considerable part of the transmitted current.

Fig. 6 illustrates something of the condition which every telephone circuit fulfils, the condensers shown in the figure being a mere reminder of the capacity which exists across the pair. A line one thousand miles long may have a capacity of seven microfarads, even if the two conductors are a foot apart. Any decrease of this distance of separation or any increase in the size of the wires increases the capacity; the shorter the poles the greater the capacity, and in underground or submarine cables, where the wires are very close together and are insulated with gutta-percha or rubber, the capacity runs up enormously.

The most notable effort in the direction of improving long telephone lines as alternating current transmission circuits is found in the work of Dr. Pupin. His remedy is simply that of inserting inductances at regular intervals in series with the two wires of the line, the effect of these insertions being to neutralize the capacity between wire and wire. As the capacity is distributed uniformly throughout a line of uniform construction, the ideal method of cure would seem to be the insertion of just the right amount of counteracting inductance, also distributed throughout the wire. No one has shown just how inductance may be inserted in this

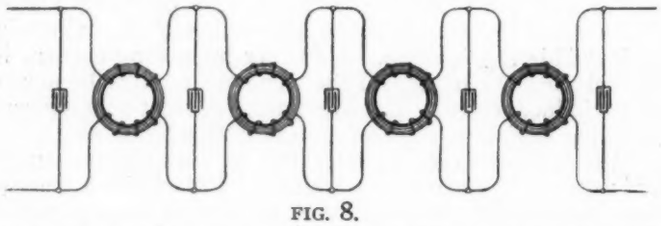


FIG. 8.

distributed fashion, so that the close approach to the same result, accomplished by inserting inductances in lumps, is a very happy solution of the problem. The practical results of Dr. Pupin's method are a very striking improvement in the volume and quality of received speech. Because of a simple mechanical analogy, circuits so equipped with inductance coils are called "loaded" circuits. Loaded circuits in underground cables are a distinct success, and that method is the best known one for improving long underground circuits, principally useful in trunk lines between the offices of a large city system. The improvement possible by inserting loading coils in long lines on poles is not so great as in the case of underground circuits. This difference in the respective improvements is due to the lower capacity and larger self-induction of the open-wire circuits. Under the best conditions, transmission over the latter is distinctly improved, but in seasons of wet or foggy weather covering most of the territory traversed by the line, a very large part, if not all, of the advantages of loading are offset. When a means has been found of distributing the inductance throughout an insulated conductor and of placing such a pair of telephone wires cheaply and easily in the earth, where insulation will remain constant, it is conceivable that much greater distances may be covered than are at present available.

Certain submarine telephone cables extending between Denmark and Sweden are provided with pairs in which each conductor is covered with a spiral wrapping of soft iron wire, the object being a similar neutralization of the mutual capacity. It is reported of these cables that their success is marked, and that the manufacturers accepted specifications which called for quite a definite performance, the results bearing out the expectation in a large degree.

Fig. 7 illustrates the Pupin method of inserting inductances, the condensers in this figure, as in Fig. 6, serving as a mere reminder of the distributed capacity, which it is the function of the coils to overcome. In actual practice, the loading coils are of the form hinted at in Fig. 8, each coil having two windings, one for each line wire, these two encircling the same iron core. The wires of the core are very

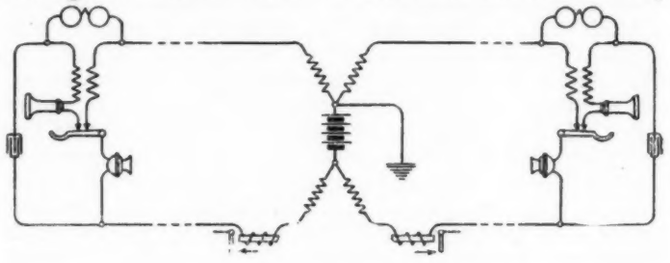


FIG. 9.

small, are insulated with a very thin compound, and the cores are ring shaped or toroidal.

LONG DISTANCE TRUNKS.

In all but the smallest communities there are enough lines of local subscribers to be switched together to require the service of more than one operator, and in such offices, unless they are very small, it is expedient to provide separate operators for the long-distance lines. In the largest communities, the lines of local subscribers are grouped in several offices, each serving its own district. Trunk lines connect these several offices for enabling any subscriber to talk to any other in the same city. One office suffices for all the long-distance lines entering such a city, and from that office trunk lines extend to the various subscribers of the local exchange proper.

These things being so, it is necessary that the subscribers have facilities for making their wants known to the long-distance office, and that the latter have facilities for calling up any subscriber wanted at a distant point. The former is accomplished by trunks leading direct from the local branch offices to special operators whose duty it is to write tickets of these calls. The latter is accomplished by means of trunks leading from the operators serving the long-distance lines to special operators in the branch offices, these having the duty of connecting those trunks with desired lines in the switchboard. It is the latter which are used for all actual conversations between long-distance lines and subscribers.

A comparison between Fig. 9 and Fig. 10 will bring out the simple but important feature that, whereas in Fig. 9 is illustrated a typical connection between two subscribers having lines in the same local branch office, Fig. 10 illustrates a connection from a subscriber in one office through his own

and a distant office by means of a trunk line. The feature of importance in Fig. 10 is that the current to energize the subscriber's transmitter is furnished to him over his own line from his own office.

Carrying this last and important point further it is instructive to note that the same feature is utilized in trunks from a long-distance office to a branch office. The called subscriber must receive current for his transmitter from the nearest possible central office, and naturally that is the office of his own district. It is further of advantage that, when he is called up over a special trunk line from the long-distance office, the operator who called him will be able to ring his bell when she may choose to do so. She may need to repeat a call or may need to delay one until the distant subscriber is at his telephone. The mechanism which accomplishes the happy result of supplying transmitter current from the nearest office stands in the way of successful ringing over the line in the ordinary manner. Fig. 11 illustrates as simply as possible the "ring-through" feature. Ringing current applied to the trunk wires *a* and *b* energizes the relay *c;* the armature of this relay in turn causes current from the battery *B* to energize the relay *d*. This relay is merely an electrical ringing key, and does the same thing as would a manual ringing key, in that sixteen-cycle current is sent to the local line from the generator *e*.

It will be seen that the cycle of events is the application of low-frequency ringing current, which controls the sending

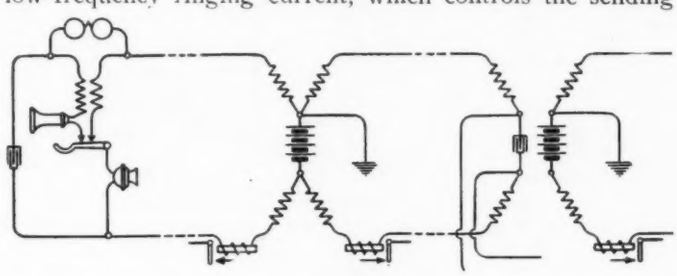


FIG. 10.

of direct current a short way, which controls the sending of low-frequency ringing current on to the called station.

In actual practice the circuit shown in Fig. 11 is accompanied by many other elements having to do with local signals, busy test, etc., but like many other circuits the apparent complication is accompanied by a surprisingly simple and accurate operation.

Even from Fig. 12 many further elements have been omitted, but enough remain to illustrate the conditions of connecting, conversation, supervision and disconnection in a circuit from a long-distance line to the switchboard containing the called subscriber.

"BOOSTER" BATTERIES.

When the principle of supplying current for transmitter purposes from the nearest office has been fulfilled a highly satisfactory local transmission is secured, even over lines of several miles length and several hundred ohms resistance. To enable the fullest advantage to be taken of transmission from these lines over the longest country circuits every minor assistance must be captured. With a given construction of transmitters there is a critical maximum current which can be carried by the granular carbon of the instrument without excessive heating and consequent noises and permanent damage. The shortest lines and the longest lines being served by one source of current common to all the potential of this source must be such as to give the longest lines current enough without giving the shortest lines too much. The very longest local lines, however, are in those systems prevented from getting enough current for the maximum efficiency when talking over long-distance lines, although they are getting enough for local conversations.

The circuit shown in Fig. 13 offers a happy solution of this difficulty. When it is understood that the circuit is intended to be used for current supply in a trunk between long-distance and local lines and that the battery *B* has a voltage of, say, fifty volts, or about twice that used for local conversation, and that the elements *r* are resistance, it will be seen that by a proper proportion of these resistances to the other things previously mentioned, just enough current may be given to the shortest lines, and quite a little more than under standard conditions to the longest lines.

"TICKET-TUBE" SYSTEM.

When only one operator is necessary in a town, all lines, both long-distance and local, being switched by her, she may

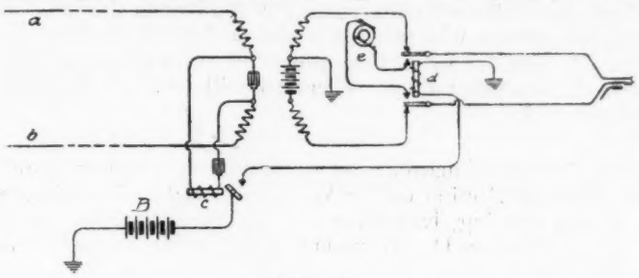


FIG. 11.

write her own tickets and execute them for all communication between long-distance and local circuits. As the community and its business grow, a condition is reached in which there may be many long-distance operators and many more local operators, and the former will need to be specialized as to their particular duties. In the largest offices, as I have indicated, the wants of the subscribers as to long-distance connections are sent in by telephone, written out on tickets, and these passed to operators who get the parties together. The problem of ticket passing so becomes important, and many ways have been practiced, culminating in the system which utilizes vacuum tubes carrying the ticket directly without any enclosing case. Fig. 14 indicates the elements of such a system, the distributing table being one at or near which the tickets are written, and from which tubes lead to all of the regular connecting long-distance operators. Suitable means maintain a vacuum in a large common tube, having a tap to a box-like valve at each such operator's position. The tickets are of uniform size, and are so scored in making as to enable a flap to be bent up easily along the edge. The distributing operator has merely to insert the ticket, flap foremost, in the open end of the tube, whereupon the air pressure behind it will drive it through to its destination, which may be nearby or far away, on the same or another floor of the same building or another. The speed

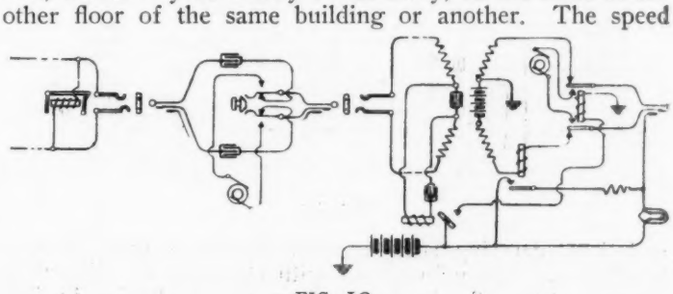


FIG. 12.

maintained by the tickets in practice is thirty feet a second. The tubing is rectangular in section, as shown, and by the exercise of much invention, it is possible to form the tubing as may be desired, the flat and edgewise bends shown in Fig. 14 being not long ago quite impossible to make from the straight stock.

Two springs in the receiving valve are normally in contact. The arrival of a ticket between them breaks a circuit, which removes a shunt from a relay. This relay in closing lights a lamp, which calls the operator's attention to the ticket's arrival.

Someone has said there are only two things about a man

which matter very much: "Who are you?" and "What do you do?" *Getting results* is what counts. The results I have tried to describe in the foregoing, simple as they are in method, show good value when measured up against the commercial effects they have produced. But if all the people are to have the benefits now available for the few, several things must be provided and these are some of them:

Cheaper line circuits.
A successful telephone repeater.
More powerful transmitters.
Multiplex telephony.

Any one of these improvements will advance the art. A multiplex system will provide a cheapening of the line circuits. A repeater or a more powerful transmitter will increase the possible radius. There are still acres of diamonds undiscovered.

The foregoing matter was presented as a paper before the Electrical Section of the Western Society of Engineers on Friday evening, November 11. In the discussion which followed, Thomas D. Lockwood spoke in his characteristic happy vein.

In comment upon an interpolated statement of the speaker, that in all the multitude of telephone repeaters which have been devised there is none which possesses sufficient merit to enable it to be used with any commercial advantage, Mr. Lockwood said that he endorsed those remarks absolutely. Confessing an influence upon the invention of names for telephonic things, he was inclined to deplore much of the careless use of words which has resulted in misleading and undescriptive terms having taken a firm place in the phraseology of the telephone art, citing as an example the multitude of names belonging to the single device sometimes known as a repeating-coil, and which is not, in a real sense, a telephone repeater. Mr. Lockwood volunteered that he would be glad to see hanged the man who invented the word "booster."

With reference to early experiences and early recollections, Mr. Lockwood spoke in the happiest fashion, he being particularly able to entertain in this direction, due to his charming personality, sparkling wit, and long connection with the industry.

F. R. McBerty contributed an interesting and valuable phase of the discussion in his comparison between transmission lines carrying alternating current for power purposes

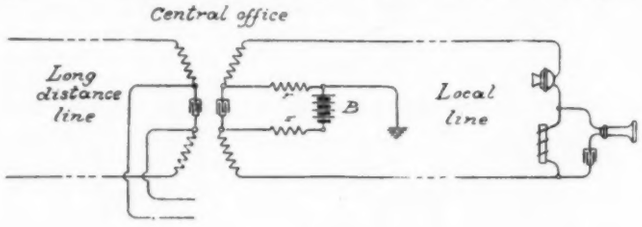


FIG. 13.

and those carrying such currents for the transmission of intelligence. He pointed out with clearness the difficulties introduced by reflection in telephone circuits having loading coils in them, and indicated the method of use of tapering devices at the terminals of such loaded lines to the end of eliminating the considerable loss due to such reflections. Mr. McBerty acknowledged graciously the force of the speaker's concluding remarks as to the nature of the necessary future improvements, laying particular stress upon the increasing hazard of unsuccessful conversation in zones of increasing diameter lying about a given city.

Kempster B. Miller called attention to the fact that a serious limitation of the usefulness of very long-distance talking lay in the difference in time between points widely separated by longitude. As a conversation requires the presence of both parties at the telephones, talking across the Atlantic, which would introduce a difference in time of five hours, would shorten up the working day in a very large measure and thus defeat, to that degree, the possibility of earning enough to warrant the very great expense of a practical submarine telephone cable between Europe and America. Mr. Miller also called attention to the peculiar problem involved in winding loading coils by machinery, and asked that Mr. McBerty explain the character of the device which does such winding. Mr. McBerty's response, prefaced by the statement that the winding machine was difficult to explain and still more difficult to draw, covered the process in a distinctly satisfactory way.

Upon question of Mr. Lockwood, with reference to the meaning of the word "toroidal," Mr. McMeen explained

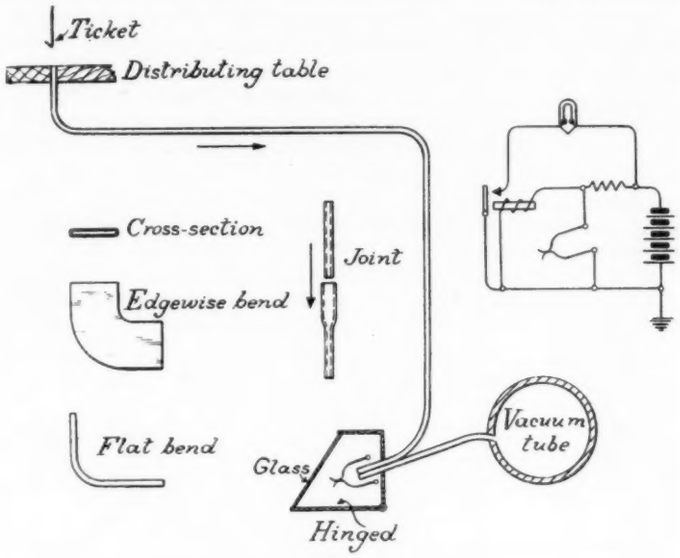


FIG. 14.

that the word means "like a torus," or, broadly speaking, that it means ring shaped, elliptical in section.

Mr. Edson and Mr. Watkins propounded queries with reference to the probable future treatment of long-distance lines carrying many circuits, and as to the reason for the use of the term "loading" in application to the Pupin treatment of long circuits. To the former the speaker replied that when wires containing distributed inductance could be twisted in pairs so as to neutralize the distributed capacity, he fully expected that such wires, formed in cables, would be laid in the earth for successful long-distance speech. To the second he replied, citing the analogy of a shaken string loaded or unloaded by small weights attached throughout its length, pointing to the similarity between the transmission of energy through such a string and the transmission of electrical energy through a circuit having or not having inductance in it.

Charles S. Winston spoke of the problem of ringing over composited circuits, and of some of the peculiar troubles met in actual telephone exchange operation.

COLORADO CITIES WIDE-AWAKE.

Frank L. Bills, the widely known Independent telephone company organizer, has lately been in Denver "just to look Colorado over," and there is much speculation rife as to what may happen. Mr. Bills also visited Colorado Springs and several other Colorado cities which have been agitating the Independent movement. He has been instrumental in organizing more than 100 Independent telephone companies in the west and middle central states, and is now just completing new systems in Lincoln, Nebraska, and Sioux City, Iowa.

Details of Modern Engineering Practice

E. W. HAMMER.

ENGINEERING practices differ from thumb-rule methods, primarily, in that the engineer builds first upon paper, while the thumb-rule artist takes a bunch of material out on the ground and does the best he can with it. The General Engineering Company of Chicago in systematizing the various details of construction of a telephone plant has kept the above distinction clearly in mind and has based its efforts on the fundamental ideas

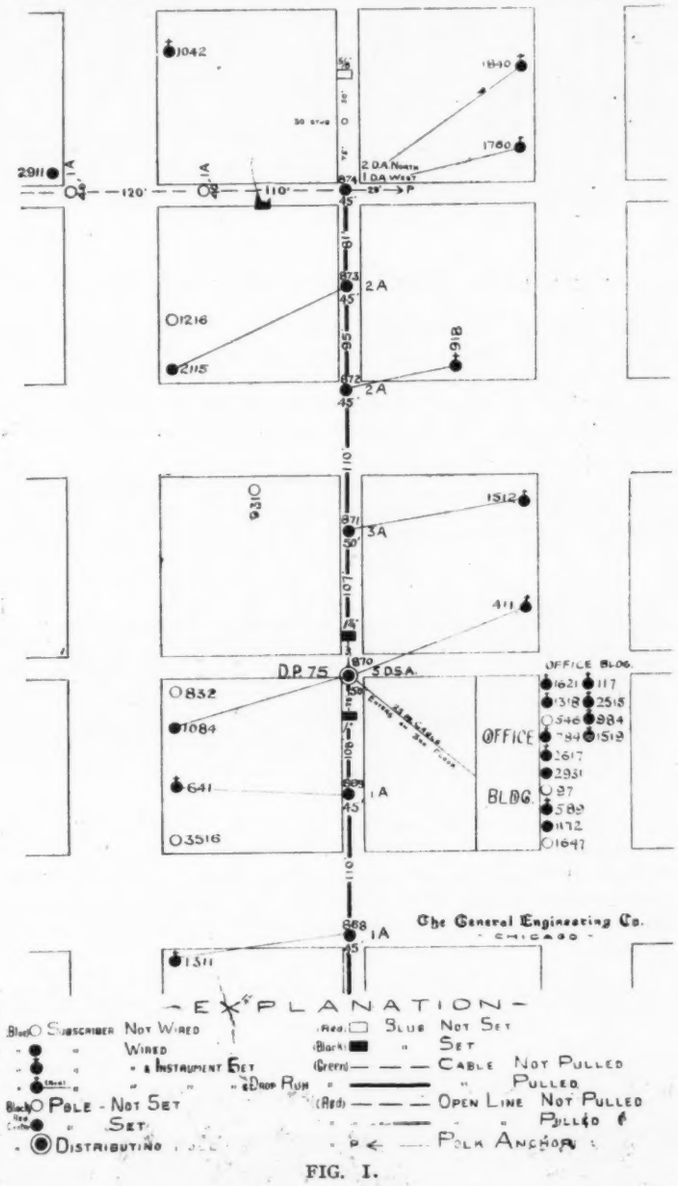


FIG. 1.

of having every detail of the construction work done upon specific written orders from its office and upon having each day's work reported in writing to the office by the various foremen and entered immediately upon the office records, so that the superintendent can tell at a glance the exact condition of the work at any time. Other objects sought have been a convenient and accurate method of time keeping, a method of keeping the costs of the various parts of the work so that the records will show daily the amounts expended in each department, a sure and accurate method of estimating the material required in all departments, the proper distribution of material on the ground and a method of locating the responsibility for careless or imperfect work. In this article it is proposed to show some of the methods employed in thus systematizing details as adopted by this company, from time to time, in its practice, with illustrations from its latest contract at Sioux City, Iowa, where a 2,000-line exchange is now being installed.

One of the first difficulties met with in the construction

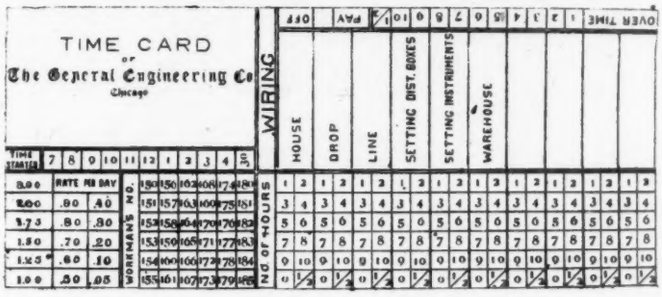


FIG. 2.

of any plant is the absence of maps drawn to a suitable scale. The ordinary city map is made on a scale of from 400 to 600 feet to the inch—entirely too small to show any construction details. This difficulty was overcome at Sioux City by the making of a new map on a scale of 100 feet to the inch, the data being taken from existing maps and the records in the office of the register of deeds. To cover the territory embraced in the plans for the exchange required 15 sheets, each 36x44 inches. A small section of this map is shown in the accompanying cut and will be frequently referred to hereafter. While the maps were being prepared the subscribers' record was made up as shown in Fig. 1.

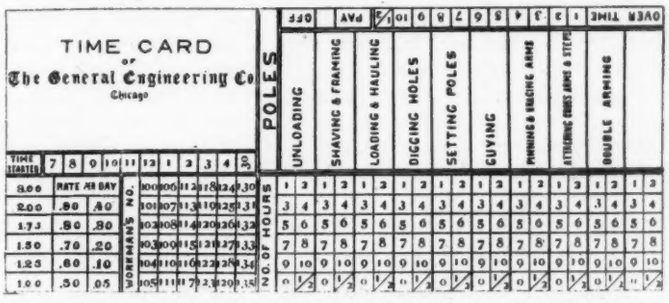
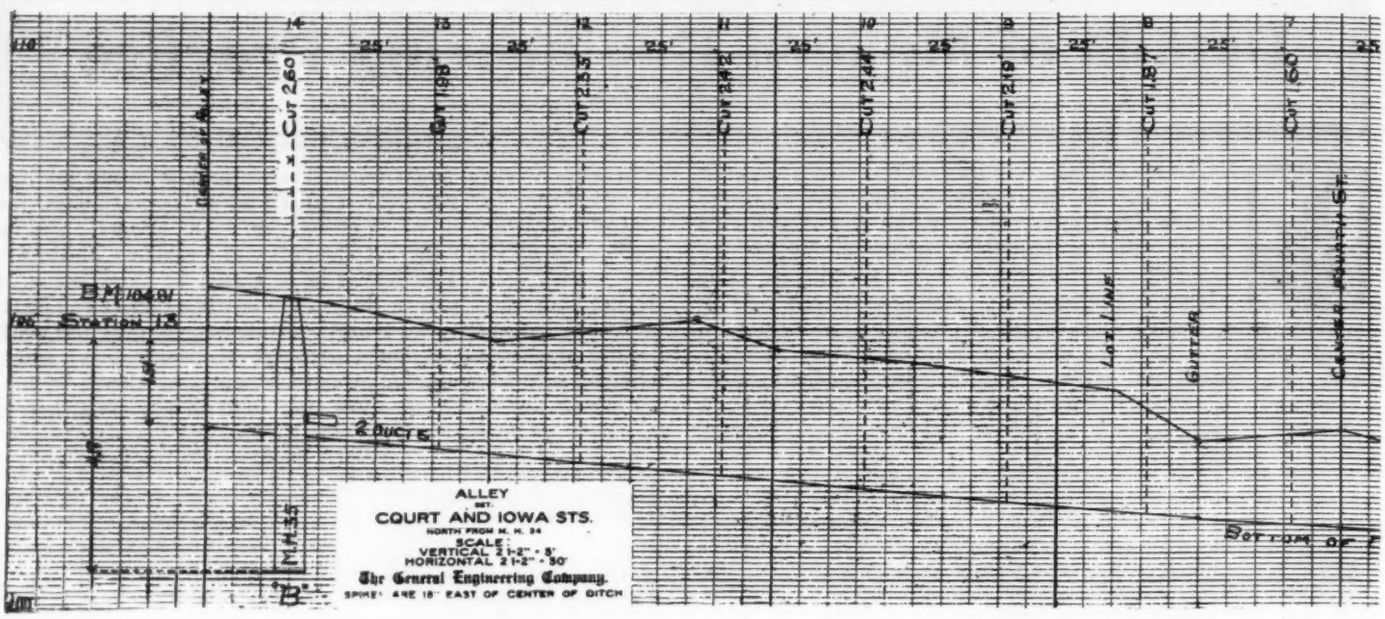


FIG. 3.

This record is made in substantial book form, the various columns being specially ruled for the purpose, and in it all subscribers are entered in alphabetical order, as fast as turned in by the solicitors, and numbered serially. In the meantime, on a small scale map, all subscribers of the Bell company were dotted in and from them a tentative scheme of the necessary cable distribution was prepared and indicated on the large map, the city being divided into 104 distributing points. As the work of construction progresses these distributing points can be rearranged where necessary. The record of subscribers is then transferred to the large map and the distributing point numbers assigned in the record. Each subscriber is indicated as shown on the cut by a small circle and his serial number placed beside it. As soon as the station is wired this circle is filled in solid. A

XUM



PRELIMINARY SURVEY AND WORKING PROFILE IN ALLEY

reference to the cut will show that Nos. 1311, 641, 1084, 411, 1621, etc., are wired and Nos. 3516, 832, 931, etc., not wired. The subscribers in the office building at the lower right hand corner are listed in the street space and the same method of distinguishing wired and unwired subscribers followed. The small crosses above several of the wired stations indicate that the telephone instruments have been set.

For the guidance of the wiring foreman lists are prepared for each day's work, giving all necessary data, and each night the day's work is reported to the office and immediately entered in the record and on the maps. In this way the city is systematically traversed and the records perfected day by day. It had been found well nigh impossible, with ordinary methods, to keep any accurate account of the several labor items, and the usual method of keeping time by having each foreman keep a time book is far from satisfactory. To remedy this a system has been devised which has worked to perfection after a test of several months' trial in actual practice. The five cuts herewith show the several time slips used and the envelope in which they are turned in each night by the foreman. It may be said that the envelope shown in the cut is an exact copy of one turned in by the foreman of a guying crew on November 15, 1904, the punch mark at the side indicating the date.

Each employe is numbered and is required to constantly wear a button bearing his number while on duty. The foreman punches a ticket each day for each man, indicating (1) the number of the workman and (2) the hours put in on each subdivision of the work. As will be noticed, space is

TIME CARD
of
The General Engineering Co
Chicago

CABLES

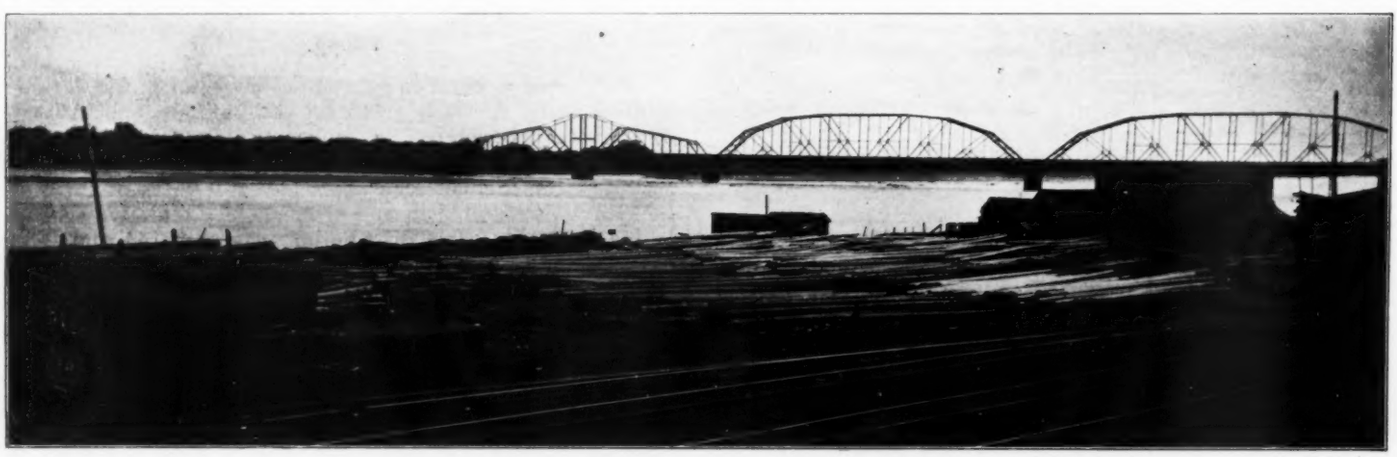
TIME STARTED	7	8	9	10	11	12	1	2	3	4	5
RATE PER DAY											
3.00		.80	.40			200	201	202	203	204	205
2.00		.80	.40			206	207	208	209	210	211
1.75		.80	.30			212	213	214	215	216	217
1.50		.70	.20			218	219	220	221	222	223
1.25		.60	.10			224	225	226	227	228	229
1.00		.50	.05			230	231	232	233	234	235

WORKMAN'S NO.

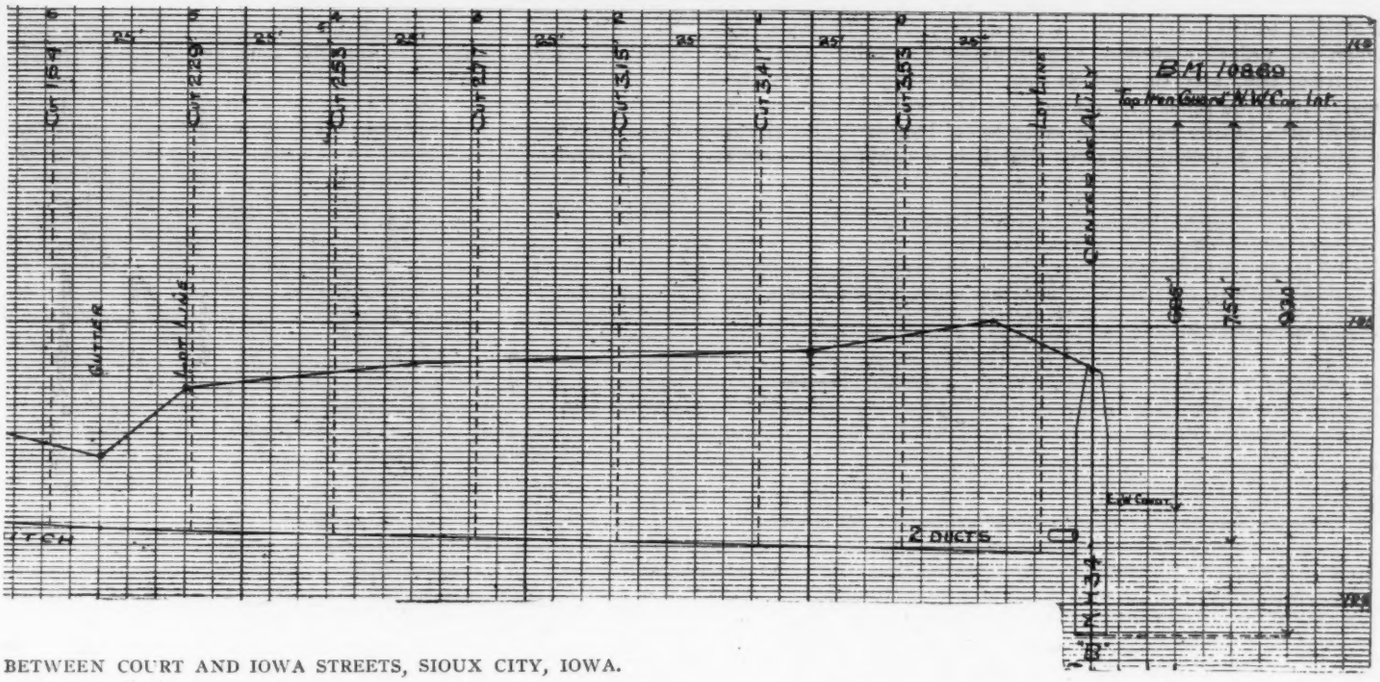
NO. OF HOURS	OFF	PAY ½	1	2	3	4	5	6	7	8	9	10	OVER TIME 1	2	3
TEAMING			1	2	3	4	5	6	7	8	9	10			
STRINGING MESSING STRAND			1	2	3	4	5	6	7	8	9	10			
HANGING AERIAL CABLE			1	2	3	4	5	6	7	8	9	10			
SPLICING AERIAL CABLE			1	2	3	4	5	6	7	8	9	10			
SPLICING UNDERG'D CABLE			1	2	3	4	5	6	7	8	9	10			
DRAWING UNDERG'D CABLE			1	2	3	4	5	6	7	8	9	10			
CONNECTING BOXES			1	2	3	4	5	6	7	8	9	10			
CONNECTING RACKS			1	2	3	4	5	6	7	8	9	10			

FIG. 4.

provided also for the daily wage, time of beginning work, for overtime and for discharge. The first ticket punched for each man will show the wage and the time work was begun. Subsequent tickets need show only the workman's number and the number of hours under the proper heading or headings.



POLE YARD OF GENERAL ENGINEERING COMPANY AT SIOUX CITY, IOWA.



BETWEEN COURT AND IOWA STREETS, SIOUX CITY, IOWA.

It will be observed that the underground tickets differ from the others in having A. M. and P. M. divisions. This is done because the conduit crew being very large (from 80 to 100 men) it would be well nigh impossible for the underground foreman to keep accurate account of the work. Hence these tickets are printed on cardboard, and each man is given a ticket with his tools in the morning. Just before

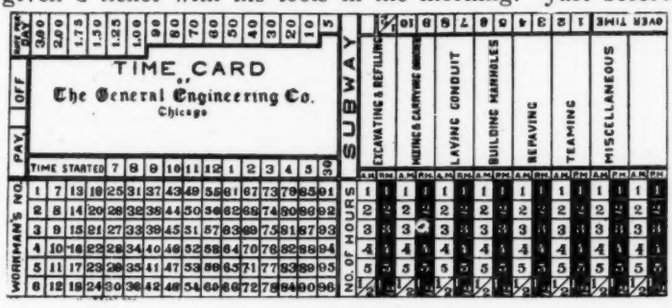


FIG. 5.

noon the tickets are punched and handed back to the men and again punched and collected just before 6 o'clock in the evening. In this way no difficulty is found in keeping the time with absolute correctness and in apportioning the labor cost properly amongst the several headings.

The pay roll sheets are ruled like the tickets and the ticket record is transferred directly to the sheet each day so

Form 1

CONTRACT.....Sioux City, Ia. THE GENERAL ENGINEERING CO.

Serial No.	Subscriber	Address	D. P.	Wired	Drop Run	Line Run	Inst. Set	Inst. No.	Cable	Rack No.	Remarks
.....	.....	.....	....	....	....	....	....	....	....	....	.....
.....	.....	.....	....	....	....	....	....	....	....	....	.....

that, at any time, the pay roll presents an exact record of the labor account properly subdivided.

The record of the cost of labor as divided amongst the various headings furnishes information of the greatest value, as showing the exact cost of each step in the construction of the plant and, in addition, these records prevent all disputes and practically eliminate all chances of mistakes. The foreman's punch acts as his signature and he is not asked to use a pencil in any of the operations connected with keeping the labor record. Of course it will be understood that an office record is kept in which the men's names and numbers are entered.

While the inside wiring is proceeding the pole lines are surveyed and staked out. A record is kept showing the size of each pole, distance apart of poles and such other data as will be of service, including crossings over or under other lines, clearances, etc. After the preliminary staking the lines

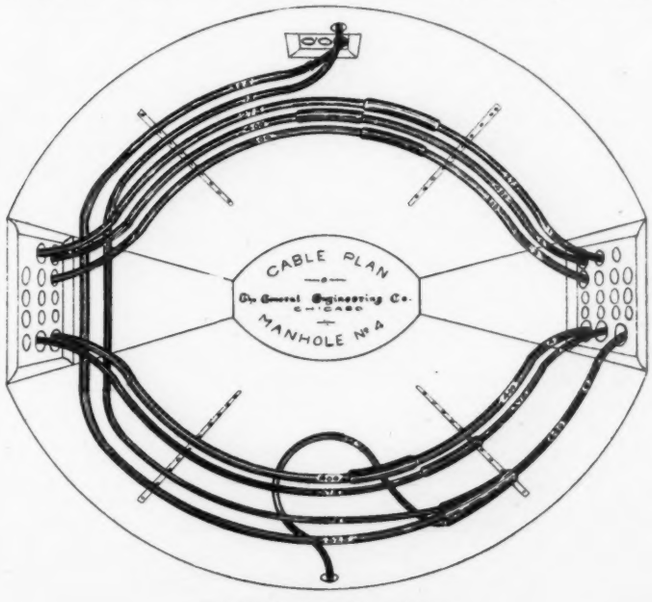


DIAGRAM OF MANHOLE.

are all run with a transit and the stakes set precisely in lines and marked with the size of the pole to be set. In transferring the pole record to the maps the same plan is adopted as with the subscribers—that is, the location of the pole designated by an open circle, which is filled in as soon as the pole is set. Inks of different colors are used to distinguish the several sets of entries as shown in the explanation at the bottom of the cut. Each pole is stenciled with a serial number and this number entered on the map, together with the other data collected. A reference to the cut will show that poles Nos. 868 to 874 inclusive are set, while the

XUM

two poles to the west of 874 are not set. The distances between the poles as shown, beginning at the south end, are 110, 108, 107, 110, 95 and 81 feet, while the stakes to the west, where the poles are not set, are 110 and 120 feet apart. The figures beside each pole indicate its length. The circle around pole No. 870 indicates that it is a cable pole, being

Form 6

THE GENERAL ENGINEERING CO.
CHICAGO

This envelope is to be used for enclosing the Daily Time Tickets of the workmen, and any other papers that are to go to the office. The date of the Time Tickets enclosed is to be indicated by punch in date column below. Each foreman must turn in his reports dai y in one of these envelopes

LOCATION OF WORK.

DATE		MATERIAL USED.	AMOUNT OF WORK DONE.
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			

distributing point No. 75. The figures followed by "A," "D. A." or "D. S. A.," indicate the arms required. Thus the cable pole carries five pairs of double standard arms, pole No. 871 three single arms, the junction pole No. 874 two double arms facing north, and one double arm facing west. These figures are entered on the map originally in pencil and changed to ink when the arms are set.

It will be noticed that the guying is also indicated by the squares on either side of the cable pole and north and east of pole No. 874. These are originally ruled in in outline as soon as the locations are staked, and filled in solid when the work is done. A glance at the map shows that both slugs at the cable pole are set, the stub and slug north of

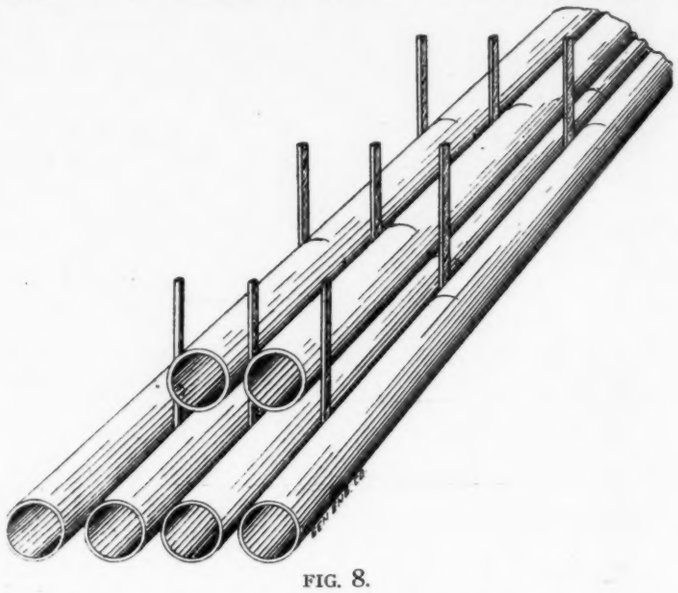


FIG. 8.

874 not set, and the Polk anchor twenty-nine feet to the east of 874 also set.

All slugs and stubs are laid out and staked as carefully as

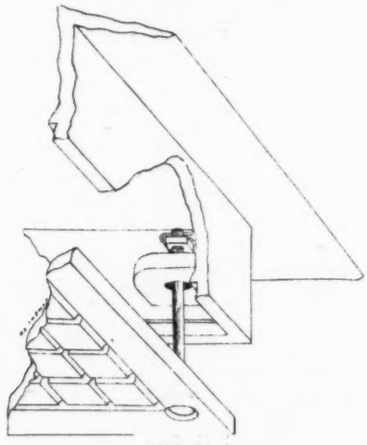


FIG. 9.

the pole lines and the size of anchor rods and guys determined in advance, so that nothing is left to the discretion of

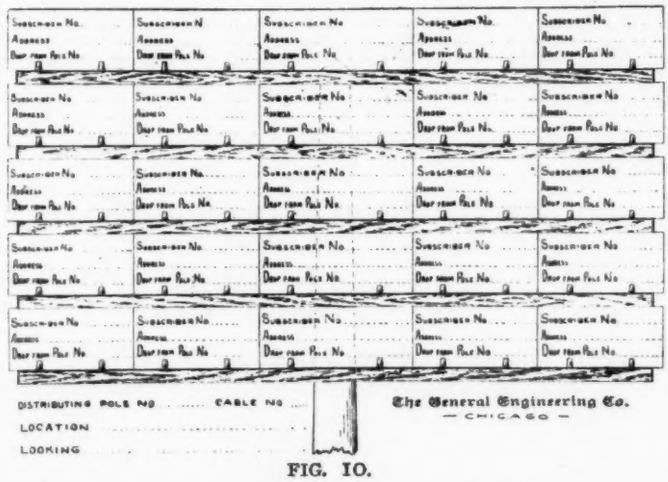
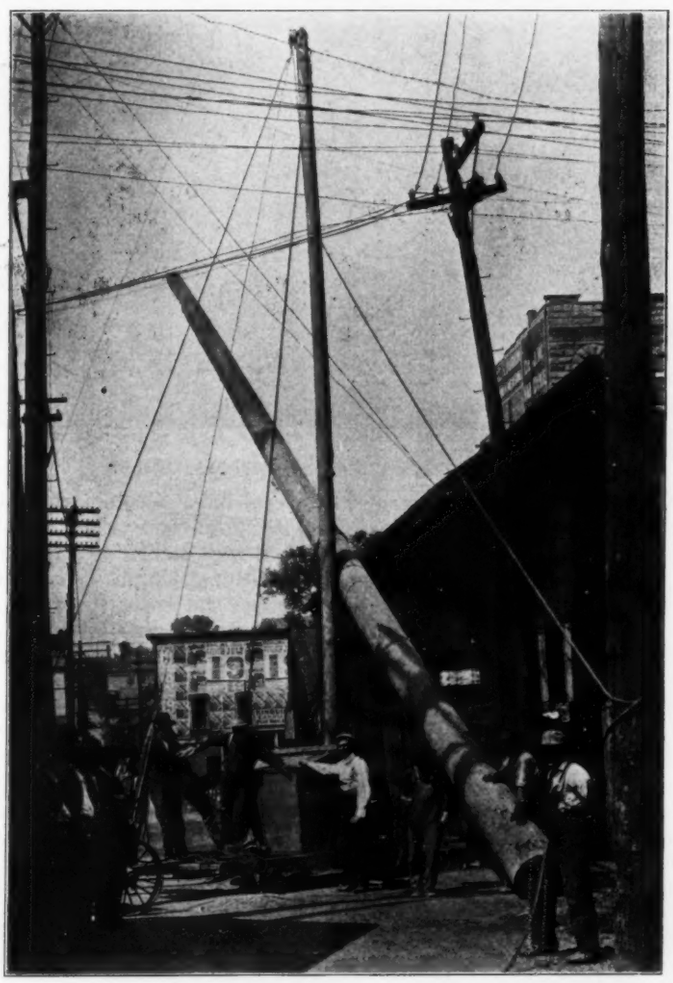


FIG. 10.

the workmen. Thus in setting the two slugs shown at pole No. 870 the men who dig the holes have a list showing that thirty feet north of the pole a stake is set and a heavy slug

with a 1¼-inch rod required, while on the south side the stake is twenty-eight feet from the pole and the slug is to be set with a one-inch rod. The same detail is shown at pole No. 874. When the guying crew reaches the same point the foreman's list will show a double one-half-inch guy to the north and two three-eighths-inch guys to the south. These guys are indicated originally in pencil and changed to ink as soon as they are set. The drops are treated in the same manner, a list being made from the maps and given to the foreman, showing the subscriber's number and address, and having two blank columns, in one of which he enters the number of the pole from which the drop is run and in the other the style of drop wire used. This list he returns to the office daily that the drops may be entered on the maps. The cut shows that all wired subscribers, except the



MODERN METHOD OF HOISTING POLE.

two west of No. 874, where the poles are not yet set, have their drops run, and the poles from which the drops come are clearly indicated. Concerning the subscribers in the office buildings it will be noticed that this is to be entered with cable and the entrance on the third floor is noted.

All this sounds rather complicated and the first impulse of many readers will be to say, "So much detail cannot be kept up, nor is it worth the trouble and expense involved." As a matter of fact, the keeping up of the detail is a very simple matter and the time required is surprisingly little. Our draughtsman finds no difficulty in keeping his maps and records up-to-date with two or three hours' work per day, and as to being worth the trouble, it will suffice to say that these maps have saved scores of trips to different parts of the plant, which would otherwise have been necessary. Further, the exact condition of the contract may be examined at any time and accurate estimates of progress made.

It seemed to the officers of the company that more underground work could be done on paper than is generally supposed. At any rate the experiment seemed worth trying, and an accurate survey of all the streets and alleys to be traversed by the conduits was made. The location of each

VIEW SHOWING CONDUIT CONSTRUCTION.

manhole being decided on, stations were established and hubs set by transit every twenty-five feet between manholes. These hubs were set far enough to one side not to be disturbed by the excavation. A series of levels was run on the hubs and accurate profiles made. One of these is shown

MAIN MANHOLE.

in cut No. 7. As will be seen this profile gives the exact cut at each station, depth of manholes and all other information required. It will suffice to say in this connection that the company has found this method so expeditious and economical, doing away as it does with all instrument work during

construction, that it has become a part of its settled practice and will be adopted on all future contracts.

In laying the ducts several little wrinkles suggested themselves which may be of some interest. The duct selected for use in Sioux City was the single type made by the Fibre

SPECIMEN POLE USED IN CONSTRUCTION.

Conduit Company, and it became apparent at once that some simple method should be devised to maintain a regular spacing and alignment. After one or two experiments 100 iron stakes were made, each 30 inches long, of ¾x½ inch iron and pointed. As soon as the concrete bottom was in place these stakes were firmly driven and the pipes laid between them. Cut No. 8 shows the idea and a glance at the accompanying illustration will show how excellently it worked out in practice. Of course the stakes can be used

VIEW SHOWING CONDUITS IN TRENCH.

over and over again, being withdrawn as soon as the "pile" of ducts is in place and concreted.

Every subway man is familiar with annoyances incidental to pulling cables when round manhole frames are used—skids slipping and slewing, the necessity and difficulty of blocking, etc. On the other hand the square frame seemed impracticable, owing to the danger of the cover falling in if carelessly handled, and possibly inflicting irreparable damage on the cables. Cut No. 9 shows a simple little device which was designed to remedy this defect without increasing the cost of the frame. As will be seen, a square lug is cast with the frame and cored with a one-inch hole. In a corner of the cover a corresponding hole is cored out and through these holes a five-eighths inch carriage bolt is passed on which the cover turns, as on a pivot. The result is that the cover can, by no possibility, slip into the hole. The difference of the diameter of hole and bolt is to provide plenty of lost motion, so as to allow room to raise the cover, with its ribs, clear of the frame and swing it to the side. The nut is secured against coming off by a spring cotter through the bolt below it.

The value of accurate maps and records increases as the plant nears completion and finds its ultimate expression in the final distribution of the wire plant. Cut No. 10 shows the terminal pole sheet, which in reality is only an enlargement of similar forms heretofore used. From the maps the line wires for each distributing point are arranged *in the*

ANOTHER VIEW OF MAIN MANHOLE.

office and the wire stringing crews have nothing to do but follow the directions. As every wired subscriber appears on the map and his drop is shown running from the proper pole, it becomes a matter of the utmost simplicity not only to assign the pin numbers to the several subscribers, but to assign them intelligently leaving vacant pins where there appears most probability of their being useful, and so avoiding much cutting over later.

As a further example of the possbility of doing much work in the office that is generally left to be done in the field, cut No. 11, illustrating the proposed arrangement of cables in a manhole, is submitted. From this set of plans (one being made for each manhole) the cable foreman can determine, when drawing in his cables, the direction from

CENTRAL DISTRIBUTING POLE YARD.

which to draw, the exact amount of slack that will be required in each manhole, and the proper duct for the cable. The cable splicers will be required to conform as nearly as possible to the scheme shown.

We repeat that the cardinal principles observed by the General Engineering Company in the construction of its plants are: (1) To systematize every department; (2) to arrange every possible detail in the office from data properly collected, and (3) to insist on the plans being minutely fol-

lowed, except in case of manifest necessity. So far as the Sioux City contract has progressed these principles have been strictly adhered to and surprisingly few changes have been found necessary. It is believed that a system of this sort results in great increases of efficiency and consequent saving of cost all along the line and, what is far more important, better workmanship throughout the plant. The foremen and skilled workmen are enthusiastic over having their work clearly outlined for them, and the conscientious foreman is particularly gratified that his success in doing good work with his crew is brought each day to the notice of the superintendent in writing, while the laggard knows that his failure to keep up with the procession will be duly recorded before noon of the day following.

Another great advantage of this style of keeping records lies in the fact that supplies of all sorts can be ordered with very close approaches to accurate quantities. Knowing the exact number of poles set and the size of each it is a simple matter to count up the steps required, as also the arms and pole hardware. The line wires can be measured with absolute accuracy, and so through all the other details of the plant. Messenger and guying strand, messenger supports, cable clips, etc., can be actually measured and counted—not guessed at or estimated. This feature alone will repay all the trouble expended on the system.

The General Engineering Company is convinced that such details as are here touched upon, and many others not mentioned, are well worthy of the careful attenion of the engineer in charge and should not be left to the tender mercies of the average lineman with his thumb-rule methods.

MUTUAL TELEPHONE COMPANIES.

BY R. W. KEMP.

Just what part mutual telephone companies will play in the telephone field is at the present time unknown. As most of us think of them, we can picture only a poorly constructed rural line loaded down by telephones of all grades. But this is not altogether the case; they are being built in a more workmanlike manner than formerly, and are being kept up in good condition; they are now making some point a center and all lines converging there, thus securing free connection with each other.

The mutual companies cannot be classed as either Independent or Bell, as they are an entirely separate organization and depend upon neither for protection or support. They are organized in the same manner as any other company, only any member is prohibited from securing a majority of stock. The companies are not composed of farmers alone, but also the business men of each town.

In building the lines each line is laid out and the cost of building is figured and each subscriber or member pays an equal portion of the expense. Any person becoming a member after the line is completed must pay the same amount as the original builders of the line, and the amount over the cost of connecting him on the line is placed in a fund to keep up the line and pay the switch fees. All lines centering at one place pay an equal proportion of the switchboard and central office, and an equal share of the operating expenses. Each member must buy and keep in repair at his individual expense his own telephone, and it must be of the resistance adopted by the line. This telephone does not become the property of the company, but belongs to the subscriber.

In each city and village where the lines center the company builds a line with no subscribers on from its exchange to the exchange of some other center, which is to be used exclusively for toll business. Every subscriber has the free use of these lines built by his own center, and also with all lines that connect with these centers. All persons not subscribers to some central must pay a toll of about the same rate as charged by regular toll lines. The tolls derived from these lines go to keep up said lines and any amount over applies on the salary of the central operators. In this manner the mutual companies are operated at exact cost, each subscriber sharing equally in the general expense.

TO SAVE TELEPHONE POLES.

On account of the growing scarcity of telephone and telegraph poles and because of fear that the supply of suitable timber may become exhausted, the United States Forestry Commission is conducting a series of experiments looking toward the preservation of poles by chemical process. The new method is expected to prolong the life of the poles and make available cheaper grades of material heretofore useless to telephone and telegraph companies.

A party of government experts, headed by W. H. Harvey, of the forestry commission, is now in northern Wisconsin and the peninsula of Michigan, investigating the subject and arranging for points at which experiments will be made. The new process is a chemical treatment of that part of the poles which go underground. The treatment is calculated to harden the wood and make it resist rot. The corporations would hail its success as a deliverance from a constant and growing expense, and the government is interested in the preservation of the forests.

In accordance with the arrangement between the government and certain telephone companies, the latter will keep a monthly record of the condition of poles chemically treated, and file reports with the government. The process is secret and the treatment will be applied under the direction of the forestry commission, which will then furnish the poles to the company. The forestry commission is said to be greatly alarmed over the devastation of the forests in Wisconsin and Michigan.

OGDEN INDEPENDENT EXCHANGE OPENS.

The Ogden exchange of the Utah Independent Telephone Company was opened recently with a reception, which was attended by Gov. Wells, the Salt Lake City directors and friends to the number of sixty, who went on a special train. The exchange was thrown into service, and at the same time the long-distance service between Salt Lake and Ogden was established.

The Ogden exchange started with nearly 900 subscribers and with twenty-five operators. The long-distance line was given a trial, and it was shown that these connections can be made almost as quickly as local connections can be made. The Ogden exchange is identical with the Salt Lake City exchange, except that it is built on a smaller scale.

The management of the Utah Independent Telephone Company feels confident that the systems will be a thorough success, and will be well patronized by the public. Every indication thus far points to the fact that their expectations will be more than realized.

TELEPHONES FOR THE ERIE RAILROAD.

The Erie railroad of New York has invited estimates from telephone companies for the cost of installing a complete telephone system between Cleveland and New York. The estimates will include the cost of necessary copper wire and the cost of stringing it. The establishment of a private telephone service to the general offices in New York will relieve the overtaxed telegraph service of the road. There will be branches from the service extended into all the way stations, and any agent of the company will be able to call up his officials at headquarters and hold personal conversation with them when occasion demands.

XUM

Conventions of Independents

CENTRAL NEBRASKA TOLL LINE ASSOCIATION MEETING.

ONE of the most important meetings, as far as Independent telephone interests are concerned, that has been held in Nebraska or the west, was the one held at Grand Island November 17, at the office of the Grand Island Independent Telephone Company. The meeting was called for the purpose of perfecting the organization of the Central Nebraska Toll Line Association, which is to regulate, distribute and equalize toll charges over all Independent lines in that portion of Nebraska. Representatives were present from the following companies:

Farmers' Home Telephone Company, Shelton; Home Telephone Company, Kearney; Kearney & Northwestern Telephone Company, Kearney; Kenesaw Telephone Company, Kenesaw; Grand Island Telephone Company, Grand Island; Bradshaw Telephone Company, Bradshaw; Hamilton County Telephone Company; Platte County Telephone Company; Elm Creek Telephone Company.

These companies have an actual service of over 4,000 telephones and represent one of the greatest combinations of capital in the state.

Two preliminary meetings had been held and committees appointed to prepare by-laws for the association. These by-laws were adopted and officers were elected as follows:

President—W. J. Stadelman, Kearney.

Vice-President—L. D. Toof, Aurora.

Secretary-Treasurer—N. E. Curtice, Grand Island.

A traffic committee was elected, whose duty it will be to adjust and apportion all long-distance rates and distribute the earnings from the same. A clearing house will also be established.

The traffic committee consists of the officers, F. J. Butterfield of Grand Island and E. A. Wells of Bradshaw.

WISCONSIN INDEPENDENTS ALIVE TO SITUATION.

In view of the aggressiveness of the Wisconsin (Bell) Telephone Company in working to obtain toll line contracts with the various Independent telephone companies in southern Wisconsin, a meeting of the Independent telephone companies of southern Wisconsin and northern Illinois was held at the Myers Hotel, in Janesville, Wisconsin, on Wednesday, October 26, to talk over the situation. Delegates were present from Beloit, Orfordville, Footville, Clinton, Madison, Ft. Atkinson, Poynette, Sun Prairie, Milton, Milton Junction, Edgerton and Brodhead, Wisconsin, and Freeport, Oregon, and Caledonia, Illinois. Every delegate gave positive assurance that his company would not connect with the Bell toll lines under any condition. Richard Valentine, president of the Wisconsin Independent Telephone Association, was chosen chairman of the meeting. The matter of the failure of the Badger Telephone and Telegraph Company to furnish satisfactory toll line service between the various Independent companies in this territory was thoroughly discussed and the following resolutions were unanimously adopted:

The Badger Telegraph and Telephone Company, Milwaukee, Wisconsin.

Gentlemen:—At a meeting of representatives of the Independent telephone companies of southern Wisconsin and northern Illinois, we, the undersigned, were appointed a committee of three to draft resolutions relative to the sense of the meeting in regard to the toll service furnished by your company.

We find from statements made by those present that at the present time the service is very unsatisfactory; that many promises have been made which have not been fulfilled; that because of this unsatisfactory service and the non-compliance with promises on your part the Independent telephone companies are losing confidence in the ability and integrity of the Badger company. Therefore it is resolved by the committee:

That it is the sense of the meeting above referred to that you be requested to, as soon as possible, so reconstruct your toll lines, in those places where the service is poor, that at least fair service can be had; that the feeling of the Independent lines is such that if you do not give them reasonable service within a reasonable length of time, and fulfill the promises you have made in regard to toll line connections, the Independent companies will feel compelled to use methods of their own to get good long-distance connections.

In regard to the localities where the service is poor and the promises referred to above, we will state that your Mr. Sipperly was present at this meeting and can fully inform you in regard to the same.

A. M. Webb,
J. C. Harper,
Alfred Slater,
Committee.

The reason for this action is that the Badger Telephone and Telegraph Company has made no improvement in its toll line service for the past three years, although it has constantly made many promises to do so, the Badger company being in the hands of a couple of Milwaukee lawyers, who are not telephone men at all, and therefore do not understand the importance of giving improved service. It was the sense of the meeting that unless the Badger company had "something doing" in the near future, the various companies would take up the toll line question for themselves. As the Badger company has exclusive contracts with only a very few unimportant companies, the field is wide open for another company to take hold of the matter and make a success of it.

Richard Valentine, Chairman.

SOUTHWESTERN KANSAS INDEPENDENT TELEPHONE ASSOCIATION.

The Southwestern Kansas Independent Telephone Association recently held a meeting at Wichita, at which some very encouraging and interesting reports were made. Since the last meeting in July three trunk lines have been built from Wichita to Newton, Wellington and Winfield, while three more trunk lines are to be built from Wichita to Hutchinson, Blackwell, Oklahoma and Kingman. These will be all copper and the highest grade of long-distance construction. The line to Newton will be extended to Herrington, giving connections with Kansas City, making one of the most important reaching Wichita, as it will give that city direct connection over Independent lines to Topeka, Kansas City, St. Louis and Cincinnati. It will make connections at way points, but eventually a direct line will be built to Kansas City.

The association proposes to erect trunk copper lines between all important points in the state, and the local lines will connect with nearly every village within a radius of 150 miles, and also will be kept up to give good country service. The trunk line to Oklahoma is to be extended to Oklahoma City, where it will connect with the Independent lines to Texas, giving connection with Dallas, Fort Worth, San Antonio and Galveston.

Rural lines formed an interesting topic for discussion at the meeting, and reports from the different companies showed that wonderful progress had been made in this direction. All the companies are building lines for the benefit of farmers, it being stated that over 200 miles of country lines had been built in the vicinity of Wichita in the past three months. The financial reports of the association were

extremely gratifying, every company reporting good business and profitable ventures in every department. It was also stated by each company that no financial assistance was needed to carry out its plans and that no outside capital had been invested in any of the enterprises.

The association is composed of twenty-four of the strongest Independent telephone companies of the state and all were represented. The organization took place last winter, and Wichita was made the permanent headquarters, four meetings being held there every year. At the first meeting the following officers were elected, who are still serving: C. C. Vandeventer, president; C. Gibson, vice-president; H. D. McVay, secretary; Finlay Ross, treasurer.

WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION.

The annual convention of the Independent Telephone Association of Wisconsin will be held in Milwaukee on January 25 and 26. This is a change in the date, the convention having been called one month earlier than usual, owing to the urgency of acting upon important telephone matters. It is expected that there will be a large attendance. The headquarters will be at the Pfister Hotel, where the meetings also will be held. The officers of the association are: President, Richard Valentine, Janesville; vice-president, H. G. Slater, Waupaca; secretary-treasurer, H. C. Winter, Madison.

NORTHWESTERN TELEPHONE MEN TO MEET.

The Independent telephone men of the northwest will hold their annual meeting in Sioux Falls, South Dakota, in January. The exact date has not yet been determined upon. The territory covered by the Independent wires is all of South Dakota east of the Missouri river, Southwestern Minnesota and Northwestern Iowa From seventy-five to 100 delegates are expected to be present.

TELEPHONING IS TOO EASY.

A few generations, perhaps, will develop the Americans into a left-eared race, writes Elizabeth Banks in a recent magazine article. Their left ears will be abnormally large and abnormally acute in the matter of hearing, while their right ears will be small, ornamental appendages, totally deaf, and of no practical use whatever. I have come to this conclusion after an eight months' tour of my native country —especially the west—and a close observation of the telephone, its uses and its effects.

In the days to come the Americans will have forgotten how to write. Even now, and in the past, they never could pose as model letter writers. They can converse, brightly and interestingly, if they will take the time; but the average American letter is brief, to the point, abrupt and frequently rude. In the future they will not write any letters at all. This will be the result of the omnipresent telephone.

Few love letters are now written in the western part of America. Lovelorn couples only 400 miles apart merely call up one another when they feel lonely. The maiden in her bedroom has her telephone on a table beside the bed. The lover has his also close at hand. She rings him up at 5 o'clock in the morning or he rings her up.

"Good morning, darling! How are you?

"Is that you, sweetheart? Why, you woke me up out of a sound sleep! I was dreaming of you?"

"Is that so? Why, I was dreaming about you! I shall go to sleep again now, because it's too early to get up. Good-bye!"

In some cities, especially in the state of California, the telephone is so cheap that many families have a switch in every room, or they have the wire so long that they can carry it from one room to another. And not only is this the case in the cities, for the poorest villagers and farmers have their telephne service.

At the telephone the housewife, immediately after breakfast, sits down comfortably and does her shopping and marketing. In the afternoon she also sits there and does most of her visiting. She calls up friend after friend, has a chat, rings off. As for going out calling before first ascertaining whether her friends are at home, she never thinks of such a thing. If, when she calls up, she gets no answer to her ring, she knows her friend is out, for, twenty to one, none of the women in her set keeps a servant, and so, if they are out, the telephone bell rings all unheeded.

The most popular telephone is that which requires no ringing up of central. I found it used extensively in the state of Nebraska. By means of it you are your own central, ringing up your friends direct. It, too, is cheap, ranging from a dollar to two dollars a month.

Every business man has his telephone directly on his desk. Authors, doctors, lawyers, editors, clergymen seem to think nothing of the interruptions in their work that would drive an Englishman distracted. For a good half of the day their left ears are at the telephone.

Schoolhouses, of course, have their telephones. The teacher, going to answer the ring, is confronted with, "Miss Simpson, I can't send Johnnie to school this morning. He's got a sore throat. Will you excuse him?" Johnnie is excused, and thus Mrs. Smith is saved the trouble of writing a letter.

I have a friend who has been acting as secretary to a revivalist and has been traveling about with him to the various camp meetings this summer. Every morning, after a heavy revival, when scores of "seekers" had stood up and asked for prayers on the evening before, the revivalist handed the secretary a list of names and addresses, and said: "Just call up each one of these brothers and sisters, ask them how it goes with their souls, and tell them to keep on praying and that I'm praying for them right along."

It is almost impossible to get attention paid to a business letter written by yourself, or to get a properly written business letter in reply, in any American city where you and your business are in the same town. You are expected to have a telephone and make use of it, even though, being in a hotel where the price is ten cents for every message, you scarcely feel able to afford the expense. I should state that ten cents is the price paid for using hotel telephones in New York and the large eastern cities. In Chicago it is five cents, and out in Los Angeles, California, it is nothing. There you are welcome to use anybody's telephone.

Not only does it contribute to laziness, but it interferes with reverence and sentiment. An engaged girl whose lover lives in a town twenty miles distant confided to me the other day that she had never during the two years of her engagement had a solitary love letter or written one. "We just call each other up a dozen times a day," she said, "and we say all our nice things that way."

TELEPHONE MERGER IN TEXAS.

Arrangements have almost been completed for the merging of the local telephone exchanges at Brownwood, Goldthwaite, Coleman and Ballinger, Texas, together with about 320 miles of long-distance lines. These long-distance lines run from Lampasas to San Angelo and from Brownwood to Glen Cove, Burkett, Brady and intermediate points, and from Brownwood to Richland Springs and intermediate points. The new company which is about to take over these local exchanges and long-distance lines is headed by J. G. Watkins of Fort Worth. Extensive improvements will be made, among which will be the installing of a central energy system in each of the towns. The company will also begin work at once constructing new long-distance lines and replacing the existing lines with new copper wires.

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Economics in Telephone Engineering

LEROY W. STANTON

THE past quarter of a century has seen a most marvelous development in every phase of industry. This is strikingly true in the art of telephony. There is probably not another line of industry in which there has been such a wonderful advancement and complete revolution in methods. From the present unparalleled demand for telephone service, the indications are that the next ten years will see improvements in design of equipment and methods of construction that will eclipse the past decade. The unprecedented telephone development of the past few years has taxed the ingenuity of telephone engineers. While they have met the problems with remarkable success, there is room for even as great an improvement in the future as there has been in the past. This is especially true in equipping city exchanges where there are a large number of subscribers to be supplied with service. Owing to this fact, there have been developed two distinct methods of supplying service in large cities. One is by means of having a large individual office, while the other is accomplished by the use of multiple or branch offices connected with trunks. Each method has its advantages and its disadvantages. The single office possesses many advantages in small and medium sized cities, while in our largest cities it becomes impractical at the present state of the art to supply telephone service from one central office, and as a result, branch offices are established and connected by trunks.

In cities which will develop a telephone population not exceeding 20,000 to 25,000 telephones, within a radius of four or five miles from the telephone center, an individual office, built after the most modern ideas, possesses many advantages over multiple or branch exchanges, such as more prompt and accurate services and in effecting a decided economy in operating. Each subscriber's call, when there is only one office, is handled directly by one operator, instead of being handled by two operators through trunks connecting branch exchanges, thus saving time and expense in handling the traffic and reducing the liability of error. There is also a decided economy in other items of expense, such as rent and taxes on office building, light, heat and additional office expense. The supervision in a single office is also better, being all in one office and under one management, instead of being scattered in a number of small branch exchanges.

While in a single central office we effect a decided economy in operating expenses and give a superior service to the subscribers, we have a larger investment in the wire plant or distributing system, on which there is an annual fixed charge for interest and depreciation. With the correct number of branch offices properly located, the average wire mileage per subscriber is reduced to a minimum, owing to the fact that the subscribers are located much nearer to some one of the branch offices than if there were but one main office.

The trunks connecting the branch offices add somewhat to the total average mileage of each subscriber's line, but in a well-designed multiple office plant, the total trunk wire mileage plus the total line mileage is considerably below that of the line mileage required to connect the same subscribers to one central office. However, if there are too great a number of branch offices the total wire mileage exceeds that of the individual office, owing to the fact that the number of trunks joining the various offices increases in arithmetical progression, while the number of offices increases in direct ratio. This is clearly illustrated if we consider each subscriber's station as a branch office and join each subscriber to every other subscriber with a pair of wires, which we will consider as a trunk.

For example, to connect four subscribers it would require six pairs of wires; to connect eight subscribers would require twenty-eight pairs; to connect sixteen would require 120, and so on. From this it will be seen that there is a limit to the number of branch offices for a city of a given size, and if this number of offices is exceeded, we not only increase the total wire mileage, but also the operating expenses and complications in trunking, and decrease the efficiency of the service. In addition to the extra expense for trunks joining the various offices where multiple exchanges are employed, we have the additional expense of the trunking apparatus in the various central offices. This also increases as the number of exchanges increases, but the expense is offset more or less, owing to the decrease in the cost of the subscriber's multiple in the various exchanges, which is due to the fewer number of lines entering any one office.

The number of branch offices by which it was most economical to serve a given number of subscribers a few years ago is far from the most economical number of offices for serving the same number of subscribers under modern conditions. Recent improvements in the manufacture of lead covered cables and improved methods in outside construction have very materially reduced the cost of the wire plant. This, together with the most advanced ideas in central office equipment, has greatly increased the capacity and reduced the first cost of large individual exchanges.

Owing to improvements in switchboard construction there is, at present, no difficulty in securing a central office equipment for handling at least 12,000 lines. In some cases switchboards having a capacity of 18,000 to 20,000 lines have been installed, but such large boards are not advisable, owing to the fact that the jacks have to be made too small and the plugs used for making connection have very little strength, and are easily broken. There are also traffic disadvantages which prevent rapid and accurate work on the part of the operator. Operators in making connection in the multiple develop what would be known in psychology as the sense of muscular touch, which allows the operator to make connection almost without looking. Where small centers are used, this to a degree is lost. Operators also have to become familiar with the location of 20,000 jacks, which is beyond the capacity of most operators where rapid service is required. Four division boards have also been resorted to, but the complications arising from same make them impractical.

An exchange of 12,000 lines capacity, equipped for furnishing modern four-party line service, together with a number of private branch exchanges, increases the capacity of a single central office to 20,000 or 25,000 telephones and gives a far superior service to that furnished a few years ago over multiple boards of 5,000 to 6,000 lines capacity. Until within the last few years, large multiple boards have been a very formidable barrier to the building of large individual exchanges, on account of the size of the jack being so large that there could not be a sufficient number placed within the reach of an operator so that she could make connections with more than 5,000 or 6,000 lines. However, recent improvements in circuit designs, which have eliminated the third conductor in multiple jacks and reduced the jack to

Paper read at the International Electrical Congress at St. Louis.

the simplicity of two springs, together with the improvements in mechanical design, have reduced the size of the jack to a point where 12,000 lines can be brought within reach of an operator. In addition to the above improvements, the workmanship is much better and the price of multiple jacks has been reduced at least two-thirds below that of the much inferior product of a few years ago.

While there have been remarkable improvements in the central office equipment, there have been also rapid strides made in bettering the distribution to subscribers. Improved methods in the manufacture of telephone cable have increased their efficiency and very materially reduced their cost, so that to-day cables can be installed in underground conduits at a cost per pair of wires far below that of a few years ago, and have increased in like proportion the territory served by one exchange. Four hundred pair cables are not uncommon to-day, and in some cases 1,000-pair cables have been used. A 400-pair cable carried near the outer boundaries of a territory to be supplied by an exchange, and distributed from this point according to the most advanced practice in multiple cable distribution, serves the territory in the most economical way, and where a portion of the lines are party lines, the capacity of the cable is equivalent to an exchange of from 800 to 1,000 sub-stations. These figures are based on the average number of telephones per circuit found in a number of our leading cities.

It might also be noted that the outlying districts are heavier users of party lines than the central portion of the city. Under such conditions, groups of subscribers within a radius of four or five miles from the central office can be served much more economically, the expense of operation being below that of a branch exchange, and the first cost being very little, if any, greater, if we assume that there would be real estate purchased, a first-class building erected, modern central office equipment installed, and that the two offices be connected by trunks through cable in underground conduit. The underground conduit system remains practically the same whether the district five miles from the central office be supplied by the cable direct from the main office, or whether it is served by a branch office with connecting trunks. The additional cost of a 400-pair cable over the cost of the trunking cable to connect the branch offices, will be considerably less than the cost of real estate, building and branch office equipment, including switchboards, power plant, terminals, etc. On the other hand, the expense of the extra multiple for the 400 additional lines entering the central office will be greater, but the extra trunking equipment and multiple for same, which will be eliminated when branch offices are not used, will, more or less, balance the cost of the main office multiple.

In summing up the advantages and disadvantages of individual and multiple exchanges, we find that large individual offices possess advantages of being cheaper to operate, and through their use a more prompt and accurate service can be furnished, and that in the smaller sizes they are cheaper in first cost.

With multiple exchanges, we find that at the present state of the art, they are necessary in the larger cities, owing to the fact that satisfactory equipment cannot be secured for serving the number of subscribers that it would be necessary to serve, and from a financial standpoint, the first cost of the distributing system in large cities is too expensive. Another strong point in favor of the multiple office is that in case of fire the service of the entire system is not crippled.

While the two systems just described are handling the telephone traffic of our cities in a fairly satisfactory manner, the day is probably not far distant when they will be superseded by a combination of the two, together with the principles of automatic trunking, which will very materially reduce the first cost of the telephone system, and also decidedly reduce the cost of operation. The writer has given some thought to a system which, broadly speaking, would be one central exchange from which trunks would radiate to all parts of the city, and terminate in small automatic branch exchanges to which the present form of common battery sub-station equipment would be connected. A subscriber upon lifting the receiver from the hook would operate in the branch office a line relay the same as is used in the modern lamp signal boards and instead of lighting a line lamp, it would energize a simple selector switch, which would select that trunk line to the main office which was not busy. The trunk on being connected would operate a line relay at the central office, the operation of which would operate a single selector, which would select the operator that was not busy, and in turn select the connecting cord that was not busy, and light the lamp associated with the same. The lighting of this lamp would put the operator in talking connection with the subscriber, and upon receiving the number of the party wanted, which we will say is "Century 78," she would insert the plug of the connecting cord in the jack of the outgoing trunk to the "Century" branch. By operating an ingeniously designed selective key, she automatically and almost instantly selects the station called for and starts automatic ringing on this line, which continues until the subscriber answers. Upon inserting the plug in the trunk jack, she extinguishes the lamp lighted by the party calling, and automatically disconnects her listening set from the subscriber's line, leaving the conversation of the two subscribers absolutely private and at the same time leaving her positions open for another call. The subscribers upon completing their conversation and restoring the receivers to the switch hook, are automatically disconnected, owing to the opening of the circuit of the subscribers' line relay, which releases the automatic selector, thus leaving the trunk free for other calls and giving the subscribers an opportunity to immediately call again. It is true that there is a plug left in the outgoing trunk (until the operator removes same), but upon the automatic disconnecting of the two subscribers, this cord and plug are cut dead, the busy test taken off of the trunk jacks and a disconnect lamp signal lighted corresponding to this cord which notifies the operator to take down the cord, the taking down of which leaves this cord so it will not test busy to incoming calls.

With the system as outlined it would not be a difficult problem to handle the extreme development of our largest cities from one central office. With a development of 100,000 telephones, which some of our cities have at the present time, there would not be required to be placed in front of an operator more than a few hundred trunk jacks. These being common to this position only, there would be required only a few trunk jacks for each branch office for each operator's position. The operator in plugging into one of these jacks would operate a selector, which would automatically select a non-busy trunk to the branch exchange. Over this trunk are sent the impulses from the operator's selective key, which selects the subscribers in the branch exchange. This method saves the operator the time and trouble in testing for non-busy trunks and eliminates a great number of trunk jacks, which would otherwise be multipled in front of all the other operators. In medium-sized cities all outgoing trunks could be multipled in front of each operator. This would eliminate the outgoing trunk selector and the operator would test, as usual, for non-busy trunks. For incoming calls there would be no equipment placed in an operator's position, except a few connecting cords with their indicating lamps. Incoming calls come in over trunks which terminate in a distributing room and from these the calls are automatically distributed to the operators' positions. In large offices it would be necessary for the incoming trunks to be divided into sections, so that the selector would not have to be built so as to distribute too many operators' positions. Different classes of service, such as measured service, flat rate service, etc., would come

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in over separate sets of trunks, which distribute to sections in which there are operators who handle these classes of service only.

The first cost of the wire plant in this system will be very materially reduced, owing to the grouping of subscribers into small groups and automatically trunking the same direct to the main office. It has been found from data compiled from a number of operating exchanges that one trunk will, on an average, where the exchange is of sufficient size, carry the traffic of twelve to fifteen subscribers' telephones. In this way we gain the advantage of party lines without the attending evils. This principle has been taken advantage of to some extent in multiple exchanges, but the full benefits cannot be derived, owing to the rapid increase of the number of trunks with the increase in number of the branch offices.

When branch offices are used and connected as just described, 100 branch offices would require 4,950 separate sets of trunks, while with direct trunking to one central exchange, there will be only 100 sets of trunks required, or the same number of sets of trunks as there are offices. Therefore, in direct trunking we would use one set of trunks composed of a large number of circuits, instead of 100 sets of trunks with few circuits in each set of trunks.

It has been observed in practice that in offices which have only a few trunk circuits joining another office, the average maximum number of messages per trunk circuit per day did not exceed 70 to 80. While in large offices requiring a great number of trunk circuits, each circuit has been known to average as high as 157 messages per day. From the data given, it may be seen that trunks from a large office carry more than twice as much business per circuit per day as do trunks from a small office. This is due to the greater fluctuation of the traffic from small offices. We thus see that there is a decided saving where the business demands a large number of trunk circuits and in the system of direct trunking where a large number of trunk circuits are used. There is also a saving of the time in connecting and in disconnecting due to the automatic trunking and in the elimination of order wires, etc. From this we see the advantages to be gained where the direct trunking is employed. In the system as outlined all calls have to be trunked, but in small multiple offices, the number of calls trunked sometimes reaches ninety-five per cent of the total calls, so the extra trunking would not be of great consequence.

The system allows the use of the present common battery telephone set, which is simplicity itself, and adds no complications to the telephones which are scattered over miles of area, all equipment which is liable to derangement being located in the central or branch offices. The branch offices would not require installation of expensive power equipment. All power or current required for operating the branch exchanges could be supplied from the central office. All current for talking would be fed from the cord circuits in the central office where forty or fifty volts would be used, which would prevent an excessive drop of voltage on the long line. This, in connection with the latest design of transmitters, which are especially designed to work on lines of high resistance, solves the problem of supplying the subscribers with service who are remote from the central office. In case the branch exchanges are too great a distance from the central office, the subscribers' loops can be supplied with battery for operating their transmitters from the branch exchanges, only a slight modification in the equipment being necessary to accomplish this result. There would be no ringing current required at the branch office and the current for operating the line relays and selector switches would be small and could be supplied by local storage batteries charged from 110-volt circuit over trunk wires from the central office. This plan was devised by the writer a few years ago for supplying the private branch exchanges for the Cuyahoga Telephone Company of Cleveland, Ohio, which company is now operating nearly 100 private branch lamp signal boards from storage batteries charged over trunks as above described, or from lighting circuits. The results are proving very satisfactory and quite economical. In charging the batteries sufficient resistance is inserted in the trunks or feed wires so that the batteries receive the proper amount of current to maintain them at full charge. Every two weeks inspection is made by an inspector who tests the specific gravity of each cell, takes a voltage reading and inspects the private branch board. The cost of maintenance is in this way reduced to a minimum. By a plan similar to the one just described small sub-branches could be maintained at a minimum cost.

The space required for locating these branch exchanges would be small. An inexpensive room in one of the large office buildings would answer very well for supplying such buildings in the business districts. In the outlying districts suitable quarters could be secured at a much lower cost than where extensive equipment has to be housed and operators' quarters provided. The greater the number of branch exchanges, the less the wire mileage for each subscriber. One main underground cable could be tributary to a number of small branch exchanges. The system, beside being more economical in first cost, admits of a decided saving in operating expenses. The number of operators is very materially reduced. The trunking, or B operators, are eliminated entirely and quite a number also of the regular A operators, due to the fact that each operator would be working at her highest efficiency at all hours of the day. She would be constantly busy, and the service would be prompt and uniform, due to the fact that she would never be overloaded, as she can only receive one call at a time, due to the automatic distribution of the calls to the non-busy operators. The subscriber in lifting the telephone from the switch hook is immediately put in talking connection with the operator and gives the number desired to the operator without her requesting "number." She repeats the same, glances at the keyboard and sees a lighted lamp, which indicates the cord to be used, thereupon she plugs into the outgoing trunk jack and presses the selector key, which selects the line desired. Owing to the few number of movements required on the part of the operator, and being constantly kept busy, she will probably answer two to three times the number of calls usually answered by an operator in the same length of time.

Night service, Sunday service and such portions of the day when the load is light, a number of the operators could be dispensed with, owing to the fact that the first operator's positions receive all the calls and the last positions are only called into service during the rush hours of the morning. The system as outlined reduces the first cost of the wire plant, eliminates all the multiple, answering jacks, and line lamps, reduces the operating expenses, using equipment composed of parts of the manual and the simpler parts of the automatic, and possesses the advantages of unit, multiple and automatic exchanges.

DRAMATIC TELEPHONE MARRIAGE.

An unusual marriage took place recently in the municipal hospital of Philadelphia when Mrs. Eva H. Lyons was married to Frederick E. Mehren, who lay dangerously sick with smallpox in one of the wards. The woman risked her life to go to the ward, and the telephone was the medium through which the ceremony was performed, the magistrate being in his office several miles away. The sickroom was fitted up for the ceremony and telephone communications made directly to the bed, the magistrate being able to hear the answers to his questions clearly. Seven hours after the ceremony, however, the sick man died.

DIGEST OF TELEPHONE PATENTS

Conducted by Edward E. Clement

752,655—F. B. Cook. Cross-Arm Brace.
774,159—F. B. Cook. Cross-Arm Brace.

These two patents relate to the same subject matter, so they are given together. The first was issued February 23, 1904, and the second November 8. The idea in both is to produce a brace both stiffer and lighter than the usual solid brace, and the means employed is the rolling of the edges of a flat plate so as to form two tubular trusses. In the early patent these are separated by a web *i* left flat, and in this web the holes *c* and *d* are made for the lag screws or spikes. In the later patent the construction is the same, except that the two tubes are rolled close together to make a figure of eight in cross section, the ends being on opposite sides of the plate, like a closed *S*. The scheme seems to be a good one, and, like all of Mr. Cook's designs, it is strictly commercial.

767,437—C. R. Pitrat. Self-soldering Fuse Post.

This patent was inadvertently omitted from the digest in the September number. It is now given as of interest at the present time. The invention consists in a sneak current arrester comprising a heating element, which may be either a graphite body *1* or the usual coil, with end caps to engage line springs, one of these carrying a toothed wheel pivoted to rotate under a spring, and normally having one tooth soldered to the spring and an opposite tooth then in position to engage the line spring. When the device heats up the solder softens, the wheel turns, the line spring is released, and a succeeding tooth comes against the solder which upon cooling secures the wheel again rigidly in position.

The patent is assigned to Frank B. Cook of Chicago, and the three claims are directed to the combination of the rotary detent or wheel with the other elements.

772,380—F. Schleifenbaum and E. Schurer. Metal-sheathed Electric Cable.

This invention relates to metal sheathed cables, and is designed to increase the self-inductance in order to partly or wholly balance the electrostatic capacity. Coils are inclosed in the cable composed of closed iron wires upon which the two sides of the conductors are wound. The Germans have paid a great deal of attention to this subject, but it would appear that the perfect form of cable has not yet been produced. The present scheme is an attempt to produce a coil that will go into the cable in its first manufacture without increasing its diameter.

772,459—J. Erickson. Counter for Registering Calls for Automatic Telephone Exchanges.

This is a rather ingenious counter requiring as many impulses for its operation as will serve to complete a connection through the several steps in the automatic mechanism to the wanted line. If the connection is not obtained, or the call is not completed for any other reason, the counter is left short of registering and returns automatically to the last number, nothing but a complete call being counted. The device is shown attached to an ordinary switch frame of the Strowger automatic type, its actuating magnet *7* being cut into circuit when the switch starts, and the detent *12* being then simultaneously lowered into position to co-operate with the toothed actuating wheel *5* of the counter set. The counter itself is shown of the cyclometer type, and no novelty is claimed for it. The principal novelty lies in the arrangement of a permanent detent pawl *16* pivoted to the frame and co-operating with a set of pins *6* on the side of the wheel *5* set apart from each other an angular distance equal to several teeth, the number being the same as the number of impulses required to make a complete connection through the set of switches. Thus, suppose there are five steps required to make a complete connection through selectors and connectors, the register is set so that its pins are five teeth apart, and it takes five steps of its magnet to count one. If the line wanted is busy only four impulses go, and the pin fetches up against the side of the detent *16* instead of above it, and as soon as the switch spindle *14* goes down on restoring, the detent *12* is lifted, and the wheel is turned back until the last pin rests on the top of detent *16*, or to the last number.

772,630—A. L. Parcelle. Method of Transforming Electrical Currents.

This is an arrangement for producing loud speaking effects by changing the magnetization of two cores reciprocally, and having them both effect the same secondary coil. Each core has its own separate primary, and current either flows oppositely through the primaries, or the latter are oppositely wound. A two-cell transmitter is employed, each primary having its own cell. The carbon is compressed in one cell as it is expanded in the other; that is the changes of resistance in the two primary circuits are equal and opposite.

Experiments along the line of double-acting transmitters have been carried on for many years, and it has never been demonstrated as yet that any increase in efficiency could be attained. The present system may be an exception.

772,644—W. L. Denio. Fire Alarm System.

This is an ordinary fire alarm system, with a controller at each box which starts the make and break wheel to send the box number, and at the same time closes a ground tap through a telephone. A similar ground tap at central is taken off outside the main relay and carried through normally open back contacts of a drop shutter controlled by a magnet in the gong circuit. This cuts in the central office telephone when the signal comes in.

772,773—H. A. Barnes and N. E. Showacre. Combined Receiver and Transmitter Bracket for Telephones.

This is a two-armed bracket pivoted on the usual saddle base on the backboard and having a riser on the left side to carry the receiver, while the right side carries the transmitter. In a recess back of the backboard a vertical ratchet bar lies, having a bent lower end engaging the switch-hook, and having its teeth geared to teeth cut in the heel of the transmitter arm, through an intermediate pinion. When the transmitter is pulled down and the receiver placed at the ear, the rack is pulled up to let the switch-hook rise.

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772,782—H. T. Cedergren. Signaling Device for Telephone Systems.

This is a common battery metallic circuit system in which the two sides of each line are permanently connected to the main battery through the line relay and a balancing impedance coil, respectively. The line relay controls a local containing a cut-off relay and terminating in the test rings of the jacks. The line relay also controls another local containing the line lamp and passing through the contacts of the cut-off relay, which when energized breaks the local lamp circuit. The supervisory relays are in a third strand in the cord, connected through the sleeves to the cut-off relays when plugs are in. Supervisory lamps are in locals normally closed at relay contacts and open at switches in the respective plug seats. In operation, when the subscriber calls the line relay, closes lamp circuit, and when plug is inserted cut-off relay breaks same. As long as line relay continues energized both the cut-off and supervisory relays get current. When subscriber hangs up the line relay lets go and opens its two locals, leaving the line lamp, its cut-off relay, and the supervisory relay, without current. The supervisory lamp then lights and is put out when plug is returned to seat.

This is a three-wire system, with a three-conductor cord, and in my judgment it will not satisfy American requirements. Mr. Cedergren resides in Stockholm, Sweden.

772,833—C. E. Scribner. Telephone Exchange System.

This is a multiple system of the type in which the line relay remains connected and energized during conversations. In order to restore the line lamp upon plugging in Mr. Scribner has recourse to the old expedient of bringing the line and supervisory lamps into multiple and giving them insufficient current for both, although enough for one. Thus, when the line relay is excited for a call, the line lamp lights; when the plug is inserted the two lamps come into parallel and the line lamp goes out, the supervisory remaining dark; and finally, when the subscriber hangs up and the line relay loses current, it breaks the line lamp branch, whereupon the supervisory lamp gets all the current and lights.

In the diagram herewith *b* is the line relay, with two windings in the two sides of line, simply to balance; *f* is the line lamp, and *k* is the supervisory. The line relay pulls up its armature *b3* when excited, and lights *f*. When answering, plug *h* is inserted in jack *d;* lamps *f* and *k* are in parallel branches from point *9*, the first by way of *b4-f-8*, and the second by way of *g2-i2-k-12-14*. When the first branch is broken at *b4*, by the line relay letting go after subscriber hangs up, lamp *k* lights. Current is limited by resistance *e*.

The line relay is used also as a repeating coil in the present case. A third winding is connected to the two spring terminals of each jack.

772,871—C. A. Crapo. Telephone Exchange Trunk Circuit Apparatus.

The invention in this case comprises an arrangement of relays for automatic trunk ringing controlled from the *A* operator's position. The idea is to have a trunk connection put through, as usual, and so that the final step of inserting the trunk plug in the wanted subscriber's jack will at once connect ringing generator to his line, leaving it connected until he answers, then removing it subject to reconnection by the *A* operator for purposes of recall.

The circuits shown are all ordinary standard common battery Bell circuits, except the trunk end at *B*. A repeating coil is inserted in the trunk with a battery bridged in the forward half and a condenser in the rearward. In the diagram, *i* is a supervisory relay, *f* the ringing relay, *k* the cut-off relay for generator, and *g* the advance control relay. When the call is trunked from board *A* through jack *a*, relay *g* gets current back over tip side, and lights lamp *h*. Number being given, trunk plug *b* goes into jack *c* and relay *i* thereupon pulls up, closing and energizing ringing relay *f* and putting generator *G* to line. Coil *k'* is in one side of ringing circuit, but does not energize cut-off magnet until subscriber answers. Then armature pulls up, breaks ringing relay circuit *5* and cuts locking coil *k2* into the shunt *5* around lamp *h*, which has current as long as plug is in jack.

To repeat call, *A* operator pulls the plug and sticks it in again.

772,896—F. R. McBerty. Apparatus for Telephone Switchboards.

This is another scheme for having the line relay control both line and supervisory lamps. When a plug is inserted, a shunt around the line lamp is closed and the supervisory lamp connected in series with the two in parallel. The line-relay contacts close a shunt around the supervisory, however, which is also in series with line lamp and its shunt. When subscriber hangs up, therefore, the line relay lets go and the supervisory lamp glows.

In the diagram, *b* is the line lamp, *f* the supervisory, and *m* the line relay, while *d* and *c* are limiting resistances, and *g h* co-operating contacts on the plug and jack to close the shunt *5*.

772,897—F. R. McBerty. Busy Signal for Telephone Trunk Lines.

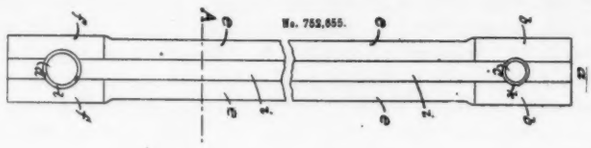
This is a comparatively simple means to give a busy signal back from the *B* operator to the *A* operator. A test relay at the plug end of the trunk gets current if line wanted is busy, and connects a buzzer back over the trunk to flash the *A* operator's supervisory. In the diagram *h* is the test relay connected to tip of plug *k* and controlling connection of the commutator *i* to the trunk wire *2* and thence back to the supervisory relay *d4* of the *A* operator. The circuit *9* of the busy-back includes locking winding *h'* on relay *h*, which holds up until the *A* plug *f* is withdrawn.

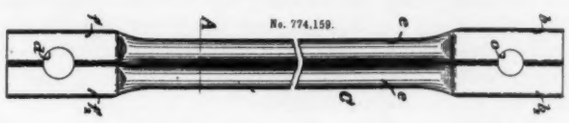
772,898—F. R. McBerty. Trunk Line for Telephone Exchanges.

This is a scheme for working trunks into common battery systems as "two-way" trunks. The subscriber's lines and cord circuits are all standard of the Bell relay type. The trunk line *1-2* between central offices *b-b* terminates in jacks *e* at both ends, and at each end as a branch leading to a "cut-on" relay *l* connected in the third conductor of the cord of a trunk plug *k* and receiving current whenever the trunk plug is inserted in a wanted subscriber's line jack. A trunk call is initiated through jack *e*, and the operator given her instructions over a separate order circuit. The insertion of the corresponding plug *k* into the wanted jack automatically connects that plug to the trunk at *l*. Supervisory relay *o* is bridged across the incoming end of each trunk, receiving current thereover, and controlling the clearing out lamp *p*, the resistance of this relay being such that it will not permit the energization of the supervisory cord relay *i* of the *A* operator until the wanted subscriber has answered. At that time advance relay *r* closes a shunt around relay *o*, and lowers the resistance of the trunk bridge sufficiently to work the supervisory relay *i* at the calling end.

772,899—F. R. McBerty. Supervisory Signal for Telephone Switchboard.

Messrs. Scribner and McBerty have undoubtedly shown a great deal of ingenuity in working out and applying circuits for common battery exchanges. I do not wish to assume the position of belittling that "persevering experimenting of skilled electricians constantly engaged in adjusting and adapting familiar principles," to which Judge Hazel recently referred in his decision holding invalid one





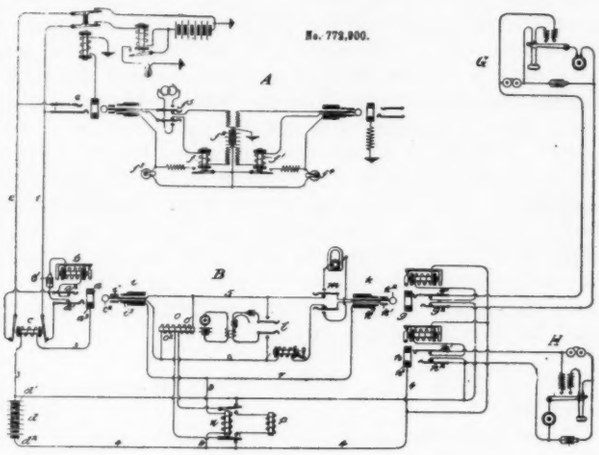
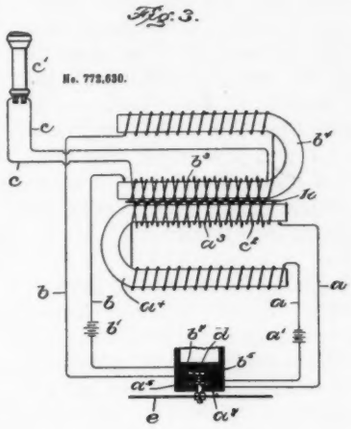


Fig. 3.



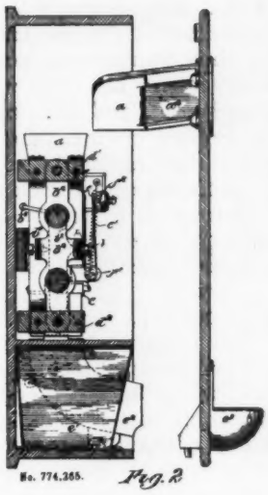
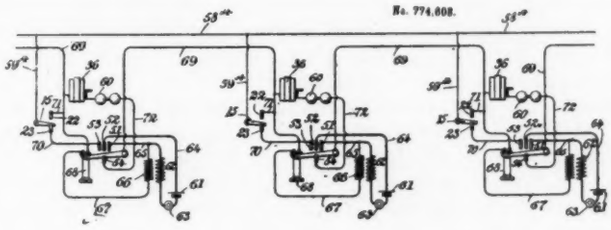
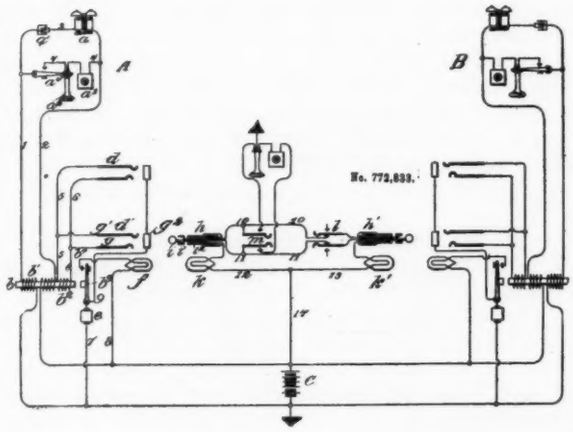
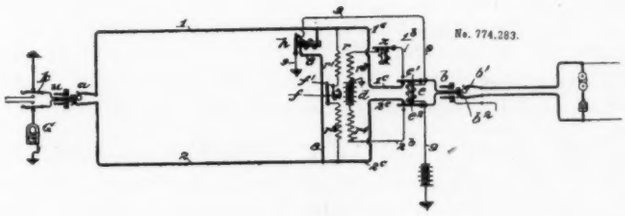
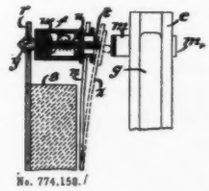


Fig. 2.









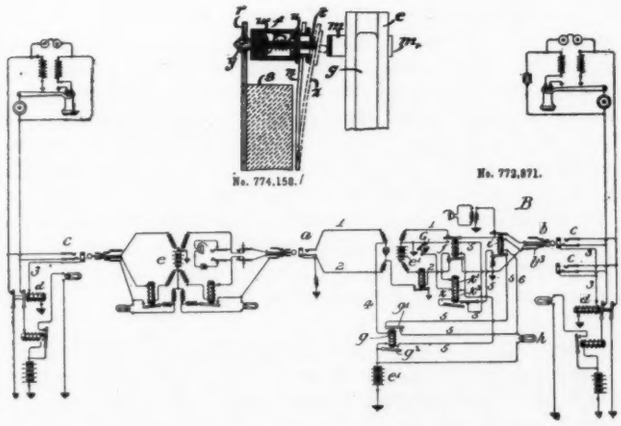
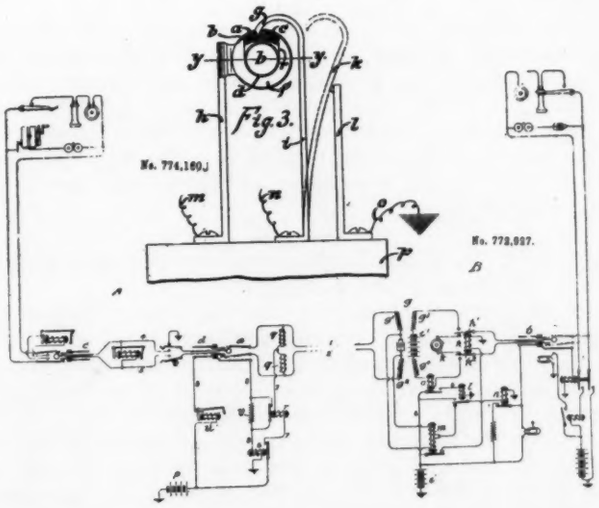


Fig. 3.



of these system patents (559,411). It has been the policy of the Western Electric and the Bell company to string out a lot of patents like the present for systems which have required engineering knowledge, but not invention for their devising, however, and I can only deplore the lack of remedy, without other suggestion than that "knocking out" in the courts be continued indefinitely.

It is old to put the line and supervisory lamps in parallel when a plug is inserted, the line relay then controlling the supervisory. The present patentee says the marginal working thus produced is not always reliable, so he puts in a shunt coil in his cord which shunts out the line lamp on plugging in, and also pulls up an armature to break the supervisory circuit. In other words a supervisory relay shunts the line lamp. It happens that this would not raise the potential of the jack rings for test unless the line relay were excited, so he also puts in a high-wound coil in series with his supervisory lamp, which gives the necessary potential difference without lighting the lamp.

772,900—J. L. McQuarrie. Telephone Exchange System.

This invention comprises means to prevent local circuits in a private branch exchange from being connected with city lines, unless specially equipped therefor, and also means to give local battery supply for the local connections at the branch exchange, but to cut out the local battery and substitute main battery when a proper connection is trunked to the city exchange.

The trunk lines at the branch terminate in jacks with drop annunciators, and cut-off relays connected between the local main battery and the jack sleeves. The branch exchange subscribers are divided into classes, consisting of those who are to have outside connection and those who are not. A high resistance cut-off relay has its coil connected between one side of the branch exchange battery and the sleeve or third strand of the cord, the trunk cut-off being on the other side of the battery. The contacts of this high resistance relay control the connection of the branch exchange battery across the cord. The branch exchange lines which are to be given trunk connections have their jack sleeves dead, while those which are local only have their jack sleeves connected direct to the battery. When a cord is connected across from the trunk jack to a line of the former class the trunk cut-off or "blocking device" does not work, but the local battery cut-off does, and current for such a connection is then derived entirely from the main exchange. When a local line is plugged to the trunk, on the other hand, the local cut-off is not in circuit, but the trunk cut-off takes current and the trunk is thereby disconnected.

In the diagram, *A* is the main exchange, with standard jacks and cord circuits; *B* is the branch exchange; *G* is a line of the first class, permitted trunk connections; and *H* is a line permitted local connections only; *c* is the trunk cut-off or blocking device, which works when lines like *H* are plugged into the trunk; while *n* is the high resistance local battery cut-off, which works when lines like *G* are trunked through.

772,927—H. M. Crane. Apparatus for Through Ringing on Telephone Trunk Lines.

This is another scheme for enabling the *A* operator to control the ringing of a wanted subscriber at a *B* board and to supervise the connection through a trunk. The *B* or plug end of the trunk is provided with an advance signal lamp and a ringing relay, both controlled by the *A* operator, the former through the contacts of her plug and the trunk jack, and the latter by her ringing key. In the diagram the subscriber's line on the *A* board is of magneto type, while that on the *B* board is of the common battery type. When plug *d* is inserted in the trunk jack *a* current from battery *p* flows over both sides of the trunk *1-2* through the differential windings of relay *m* at station *B*, and to earth through the lamp relay *n*. Relay *m* is not energized, but relay *n* shunts the lamp *t* so that it will not light when drop plug *b* is put in the line jack. The *A* operator rings the wanted subscriber by using her ordinary ringing key *e*, grounding the tip side of the trunk, as shown, whereby current flows back to ground from the upper coil *q*, and the windings of relay *m* take effective current to energize that relay and close local circuit from battery *i* to the ringing relay *h*. The latter connects generator *k* to line as long as ringing key *e* is actuated. When the called subscriber answers, supervisory relay *o* takes current, closes local from battery *i* to relay *l*, the latter cuts off relay *m* from ground and puts relay *n* on local *6* to keep lamp *t* shunted. In clearing out, when supervisory *o* loses current as the subscriber hangs up, relay *l* is cut off, and relay *m* is re-connected. The latter is not energized, but the completion of its circuit permits relay *r* at station *A* to pull up, shunting resistance *v* and displaying signal *u* by increased current. The *A* operator gets the clearing out signal from the magneto subscriber by a bridged drop, and when she pulls the plug *d* she breaks the circuit of relay *n* at station *B*, which breaks the shunt around lamp *t* and lights the disconnect signal for the trunk operator.

772,936—J. R. & C. A. Harris. Cut-Out Switch for Telephones.

This is a combination two-way switch, lightning arrester and cut-out. On a plate are mounted insulating posts on which are looped the ends of separate line wires to either of which connection may be secured. A metal ground plate is secured over the loops. A pivoted arm normally makes connection with the upper loop and is wired to the local telephone. Another pivoted arm normally makes contact with the second loop and is wired to a bell. By pulling a rope on the first lever it can be turned around to disconnect the telephone from the first loop and put it on the second, and by pulling the thing far enough both the telephone and the bell can be disconnected entirely in case of a storm. This is a cheering instance of rough and ready methods brought from the fields into the patent office.

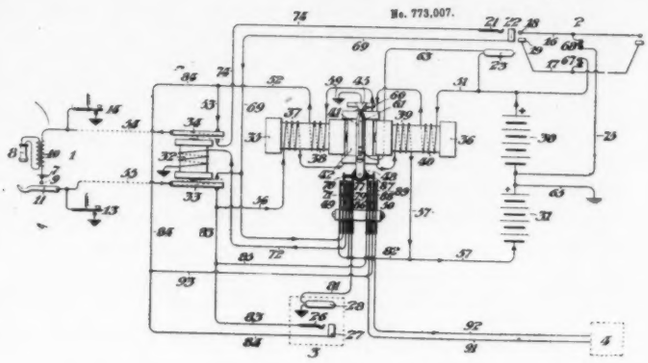
773,007—R. M. Eaton. Telephone System.

This is a somewhat complicated scheme shown applied to Kellogg circuits, whereby a subscriber can connect himself to one or more special stations, such as an information bureau or an amusement bureau, without the operator's assistance or interference. Mr. Eaton substitutes for the line relay a triple differentially wound magnetic combination controlling a double shift key, which when moved one way connects the line direct to the information bureau and when moved the other connects it to the amusement bureau. He grounds one side of his line to move it one way, and vice versa. When he wants a connection with some other station he takes down his receiver, and current in the metallic circuit neutralizes itself in this wonderful set of relays, permitting the armature to remain central and to close the local lamp circuit. When connected with the information bureau, the subscriber prevents interference with his line by cutting off his cut-off relay.

Some scheme like this would furnish an excellent means for getting rid of all those profits, in a large exchange, which the managers do not always know what to do with and are so anxious to spend for folly.

773,187—D. M. Bliss. Telephone Signaling Device.

This patent covers about as slim a proposition in the way of alleged invention as I have seen for some time. The matter presented is simply an interrupter intended to be coupled on to any motor to furnish current of different frequencies for ringing selectively. The single claim covers the following: Circuit interrupters on shafts, speed chang-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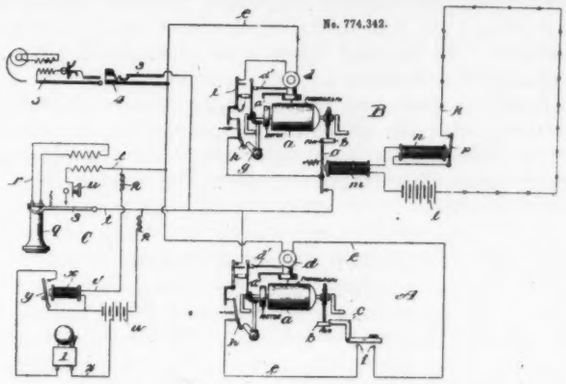
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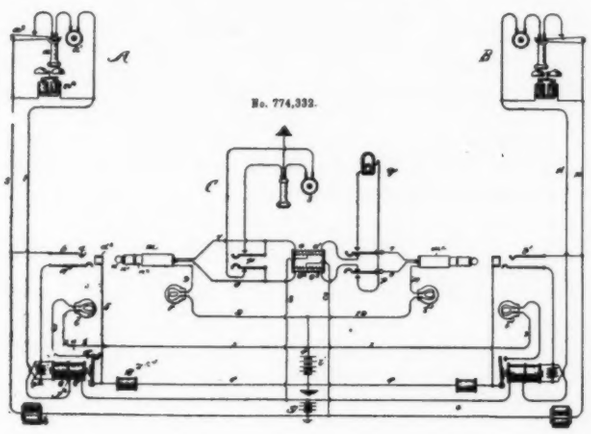
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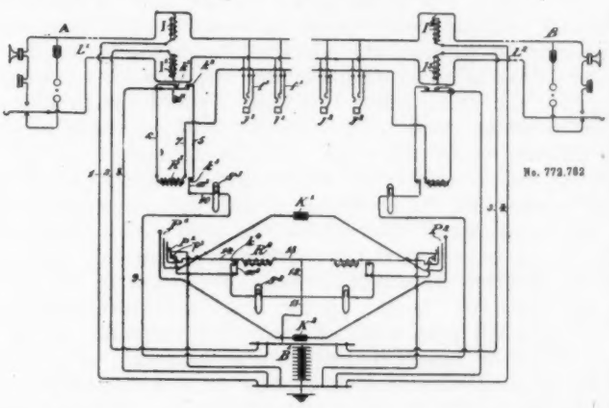
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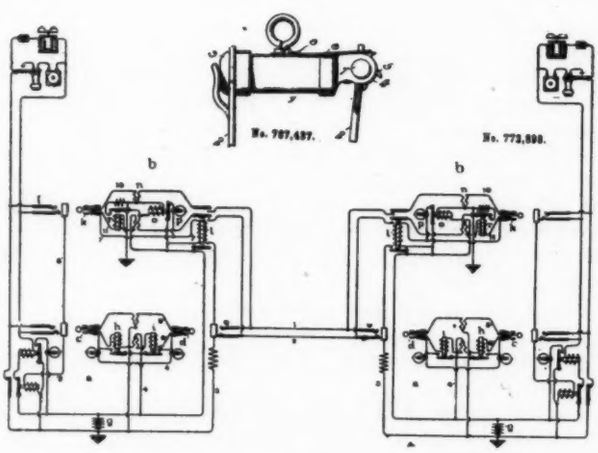
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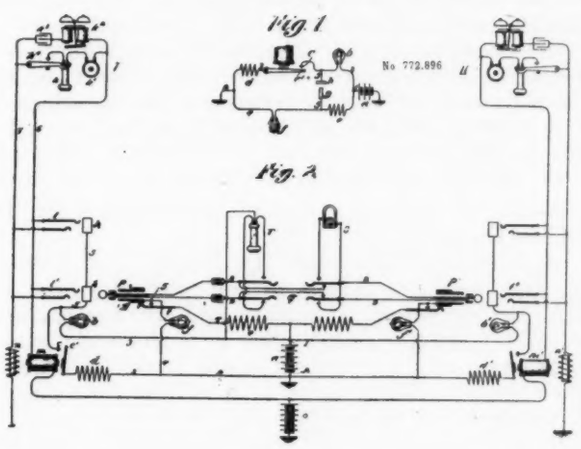
Fig. 1
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Fig. 2

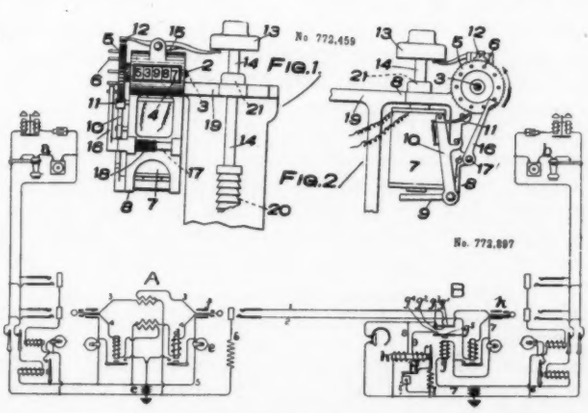
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FIG. 1.
FIG. 2.
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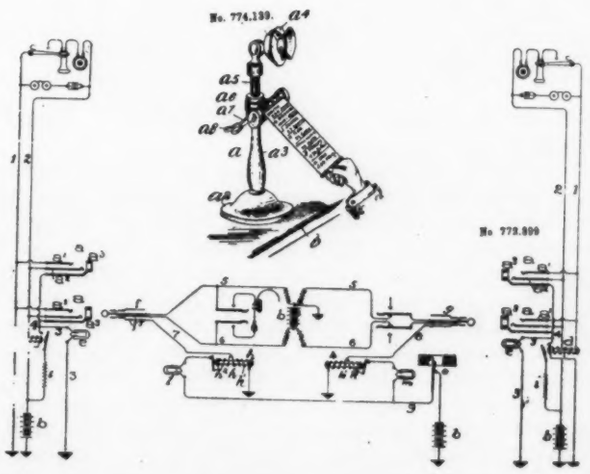
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ing gears, a frame, a coupling, a support, and a vertical adjustment for the frame to line up the shaft.

773,286—G. E. Grimm. Antiseptic Attachment for Telephone Mouthpieces.

This is a paper disk having tabs, or ears, punched out of it to slip over the edges of the mouthpiece and hold it in position. Specifically, two paper rings are provided having a tissue-paper diaphragm between them soaked in antiseptic solution.

773,372—G. A. Campbell. Electric Circuit.
773,472—G. A. Campbell. Electric Circuit.

This is the gentleman who contested Dr. Pupin's claims in the patent office as the originator of the only practicable loaded line. As everybody knows, the distinguishing feature of such a line is the inclusion in circuit of inductance sources, such as coils, along its length. The purpose of course is to balance the electrostatic capacity by the inductance, so as to avoid distortion of the voice waves passing over the line. Some time ago I noted one or two systems in which these coils were not uniform, and the present patents relate to another such an arrangement. In circuits of this character we have what are known as "reflection" losses, and the invention in both these cases is directed to the avoidance of such losses. At points of heterogeneity, that is where one kind of a circuit joins another kind of a circuit, perfect transmission fails, a portion of the waves being "reflected" back. In the first of the present patents Mr. Campbell puts coils of uniform inductance along his line, and then tapers them down, so to speak, at each end, so as to avoid any sudden change or "heterogeneity." In the second patent he puts a repeating coil at each end, which he denominates by preference a "step up transformer." In this connection he says: "The terminal transformers by furnishing a suitable ratio of transformation effect an almost complete transfer of energy between a line in which self induction is thus properly distributed and any terminal apparatus or line."

773,506—M. G. Kellogg. Multiple Switchboard for Telephone Exchanges.

To my personal knowledge Mr. Kellogg has given the patent office as much trouble as any other one man, with possibly two exceptions. Several years ago 127 patents of his escaped from the patent office in a wholesale gaol-delivery at one time. The present is one of the lot which did not then escape. The scheme is to reduce the number of jacks required, by having one jack serve two lines. To this end each jack has two contacts, one line of a pair being connected with one contact and the other line with the other contact. Suitable plugs, cords and keys are provided, and annunciators with choke coils are connected in ground taps from the lines.

773,868—F. S. Holmes. Automatic Electrical Signaling System.

The invention in this case is in the line of those recently devised, covering auxiliary apparatus operated over telephone lines when the latter are not otherwise in use. It has been proposed in burglar alarm and protective systems to send in periodic signals from a protected structure to a central office, the regular arrival of the signals showing that all is O. K. In any considerable system the necessary provision for constant signals over many lines makes so much complication as to be impracticable. The present invention avoids this difficulty by automatically measuring the predetermined time interval between successive test signals, only giving an alarm when such interval is exceeded, the alarms then being positive indications of trouble. Since the percentage of signals is small, the scheme can be applied to a telephone system without interference with its regular functions.

At the subscriber's station a periodic circuit closer is used and at central a clockwork mechanism which moves an arm continuously. The periodic signal impulses operate to close a circuit controlling a small electric motor, which acts to advance a contact or terminal ahead of the continuously moving arm. If the regular interval for the arrival of an impulse is exceeded, the arm overtakes the contact and closes a local circuit containing an alarm device such as a bell or annunciator. The motor may also wind the clockwork.

773,869—F. S. Holmes. Automatic Electrical Signaling System.

This is an improvement over the last mentioned system, and contemplates giving an alarm not only when the time interval between impulses is exceeded, but when it is not equalled, that is, when the impulses come too rapidly. Two contacts are provided, between which the constantly moving arm operates. Under normal working conditions the arm does not make contact with either, but if they go too fast it touches one, and if too slowly it touches the other; and in either case it closes an alarm circuit. A number of mechanical details such as the arrangement of annunciators, etc., are presented and claimed.

773,870—F. S. Holmes. Automatic Electrical Signaling System.

This is a further improvement in the same system. It contemplates the application of the scheme already mentioned to a common battery metallic circuit telephone line, the central battery supplying current for signaling. The signaling circuit leads from ground at the substation through the signal transmitting mechanism and by way of one conductor only of the telephone line through the central battery to ground at the central office. In addition to the usual telephone equipment, line relay, etc., two coils of a differentially wound relay are included in the two sides of line at the central office. Telephone currents neutralize, but the signaling current through one side only works the relay. Means are provided whereby in case of trouble in any one circuit the main signal circuit will be closed to send alarm signals more frequently—say once every minute. By making up alarm signals sent under different conditions of different combinations of impulses, the central office operator may be advised of the nature of the trouble at the protected structure.

Many details are also presented.

774,059—J. W. Fouche. Electrical Alarm for Telephone Call Bells.

The scheme here is to provide a simple local alarm which may be applied to and worked by the clapper of a telephone ringer to sound at a distance. A pivoted lever has one end engaged by the clapper rod so that when the latter vibrates for a call the lever will be vibrated also. The upper end of the lever carries a fork, both branches of which normally rest against outside contacts connected to the same side of a local battery bell circuit. Between the branches are mounted two contacts, both joined to the other side of the bell circuit. If the lever vibrates the fork moves to and fro to touch first one branch and then the other against the inside contact, thus intermittently closing the local circuit. The device looks like a pole changer, and works like one.

774,082—I. Kitsee. Time Metering Charge for Telephone Service.

The object of this invention is to automatically register at places more or less remote from the place of operation the charge time service of an outlying station. It is taken into consideration that present practice gives a certain rate

for the first unit of time and a different rate for additional units; also that there is one charge for day service and another rate for night service. A step-by-step meter is provided at the subscriber's station which requires the action of several relays to start it. Two or more register wheels are provided at central connected to jacks, and the operator is provided with a register plug connected to one side of each cord. The register wheels each have make and break contacts in two sets, the first set adapted to work the register for a full message charge for the first three or five minutes or other unit period; and the second set adapted to register the reduced charge for additional minutes. A certain time interval is required for either register to start, and the first connection is such that the calling subscriber only gets the necessary time allowance to register.

774,139—N. B. Porter. Telephone Directory.

This is a telephone directory written or printed on a tape or strip which is automatically rolled up on a spring roller inside a cylinder clamped onto a desk or wall set. It works like the ordinary spring tape measure, or like a shade roller, and looks like a pretty handy thing.

774,158—F. B. Cook. Protective Device for Electrical Circuits.

This is a protective outfit for a subscriber's station. It includes a pair of tubular fuses held in spring terminals or clamps without nuts, along opposite sides of a rectangular porcelain base, a pair of heat coils and carbon arresters being mounted on the base between the fuses. The heat coils are of a new self-soldering type entirely original with Mr. Cook. The ten claims are all directed to the combination of the parts named, the individual elements not being claimed herein.

774,160—F. B. Cook. Self-Soldering Thermal Protector.

This is a protector of novel design, consisting of a piece of solid graphite plated on the ends, where it is reduced to form trunions. These trunions are journaled in the forked ends of a support, to which they are soldered. The cylindrical surface of the carbon is cut into teeth, and a spring has its upper end bent over to form a pawl engaging these teeth. Circuit is completed through the carbon body and the spring pawl, and when the body heats up sufficiently to melt the solder, the spring simply turns the whole thing on its axis and flies back against the ground post. When the device has cooled off and re-soldered the spring can again be pushed up and will be held. There are eighteen claims in the patent, of which the following is a fair sample:

"7. A device operable upon a successive current, comprising a homogeneous resistance body, means acting upon the said body and tending to turn same, a heat susceptible material for holding the resistance body against rotation, and means for supporting the device in an operative position."

774,265—F. R. McBerty. Toll Collecting Appliance for Telephone Pay Stations.

This is a coin collector for toll stations in which the subscriber can be called without the necessity of depositing a coin; a coin must be deposited to originate a call; the operator controls the retention of the coin, and the controlling magnet is not affected by the working currents in the line.

For calling, the subscriber without his depositing a coin, his ringer is bridged. The coin box, however, is in a ground tap, as is the line relay at central. When a coin is deposited it closes the ground circuit by pressing together contacts *f*, and rests upon a pin projecting into the chute from the armature of a polarized magnet. The lower end of this armature controls a tilting deflector which throws the coin in or out of the till according to its position. The operator has two keys in her cord circuit, one closing a complete grounded circuit for the deflector magnet, and the other merely putting generator to one side of line, but leaving the ground dependent upon the coin contact. In making a call the subscriber drops his coin and thus signals central. If the connection can be obtained central presses the second key to send generator current and throw over the armature of the magnet to release the coin. When the latter drops it breaks the magnet circuit and the armature turns back at once, throwing over the deflector to deposit the coin in the till. If the connection wanted cannot be obtained, the operator presses the first key, which closes a complete circuit and holds the magnet armature over so as to discharge the coin into the return cup.

774,283—E. H. Smythe. Apparatus for Telephone Trunk Lines.

This is a scheme for through ringing over trunk lines. It embraces also a system of signals before the various operators concerned in the trunking operation. In the diagram a trunk *1-2* is shown normally divided by a repeating coil *r*. At one side of the repeating coil a bridge *8* is provided containing relay *h*. When ringing current is applied to the trunk this relay is energized and closes a local circuit *9* through a cut-off relay *e*, which disconnects the trunk plug from its side of the repeating coil and connects it directly back to the trunk line, as shown in heavy lines.

774,332—F. R. McBerty. Signaling Apparatus for Telephone Switchboards.

This is another modification of the scheme for putting the line and supervisory signals in parallel and controlling them both by the line relay. The patentee says that in a common battery system the arrangement of his patent No. 680,879 is not the best in the world. He says that when a plug is in the low resistance windings of the repeating coil or impedance coil in the cord will shunt the line relay so it will not work; and the invention in the present case aims to prevent this by putting an extra winding on the line relay and connecting it in series in the line outside the jack. A non-inductive shunt is connected around the winding for voice currents.

774,342—H. D. Stroud. Burglar Alarm System.

This is Harold D. Stroud of the Controller Company of America. The invention comprises a phonograph arranged to speak certain phrases into a telephone, and to repeat them over and over. Thus, in case of trouble the night operator at central would hear an insistent repetition of the words: "Burglar at 120 State street." It goes without saying that the same device can be used for fire. It can be set off by hand, or magnetically. The former method is shown in the diagram at *A*, where *c* is a key which releases the phonograph and closes the circuit at the same time. At *B* is shown magnetic control, an auxiliary circuit *k* extending through the territory to be protected and containing thermostats or circuit breakers.

774,543—F. Vollmer. Party Line Telephone System.

This is a step-by-step party line system of the stereotyped variety, having a busy signal at each station becoming set at all stations when any station calls. At each station there are a plurality of revolvable shafts, motor mechanism for rotating said shafts, time controlled mechanism for governing said motor mechanism, magnets controllable at will from either of the stations for stopping and starting the motor mechanism without disturbing the time mechanism, and contact mechanism connected with the shafts and opened and closed thereby for the purpose of completing circuit from one station to another. Each telephone has a clock in it, and if the inventor would only add a can opener, scissors and a nail file, he might advertise it as "The Farmer's Vade-Mecum, or Everybody's Friend."

XUM

Organization of a "Central" Office

A. DALLAM O'BRIEN

THERE is probably no field in the business world in which correct organization counts for more than it does in the central office of an operating telephone company.

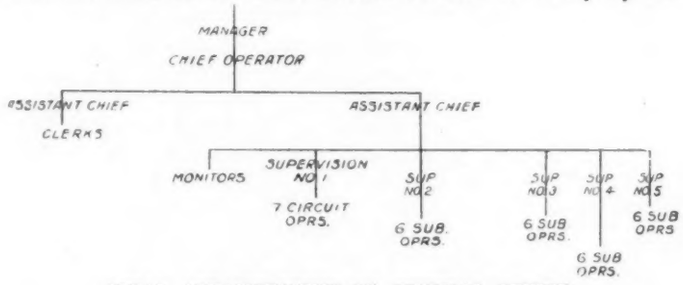
It is at this point in a telephone system that the perfections or lack of perfections in the methods employed by the company are brought into close contact with the subscribers on whom the company is dependent for its life, and the question of dividends on the capital stock may often be decided by the success or failure of the central office system. It is generally recognized that it is unwise to interfere with a man who is succeeding in bringing about the results that are most to be desired, and it is for this reason that the central office manager, after having proven his fitness, is usually left to decide the policy of his office, to choose his subordinates and to exercise an absolute control over the operators employed.

There are in the course of the telephone manager's day so many details connected with the running of the service that to attempt to carry them all is to court a failure and a speedy one. For this reason too much stress cannot be laid upon a careful and wise choice of subordinates and an equitable division of the numerous duties. It is of course apparent that the number of assistants required will depend upon the size and character of the office, and that an organization which would be suitable for a 6,000 line exchange would not apply at all in the case of an office handling only 500 lines. For example, let us consider the case of an office handling 4,000 lines, with an average calling rate of seven, or, in other words, handling 28,000 originating calls per day. Assuming further that the average operator's load is 1,200 calls per day, it will be seen that twenty-four operators will be required, thus necessitating at least eight three position subscribers' sections. To further determine the conditions to be met with consider that seventy per cent of the originating calls are handled over trunks to other offices and that the incoming trunk calls are equivalent to those handled over outgoing trunks, thus making it necessary to provide for handling 19,600 incoming calls. If now we consider that an incoming trunk operator can handle 3,000 calls per day, the operators required for this work will be seven, and from this data it will be seen that four two-position trunk sections will be required to handle the incoming traffic.

From the above data it will be seen that during the busy portion of the day there will be required a total of thirty-one operators at the switchboard, irrespective of the supervisors, monitors, chief and assistant chiefs. The required number of operators being determined the organization may be proceeded with and a glance at the chart in Fig. 1 will show the principles upon which this is based. The manager, of course, is in charge of the office and of the entire force, but in well regulated offices, while the manager should at all times be thoroughly conversant with all that is going on and with the limitations of the various operators, yet his orders should be delivered through the chief operator; and it is really upon the capability and efficiency of the chief operator that the successful management of the exchange depends.

Under the chief comes the assistants, the monitors, the supervisors, and the night chief and night force. The assistant chief operators, of which in the present instance there are two, have each their separate department and report directly to the chief operator, one assistant being in charge of the operating force and the other being entrusted with the clerical work incident to the operation of the office. The supervisors are each assigned to a particular position of the switchboard and are held responsible for the work of the operators at that position and have full charge of them. The monitors are under the direction of the assistant chief and perform such duties as may be assigned them and as will be described later. In ordinary practice where an exchange is a busy one it is usually best to provide a supervisor for every six operators, as by giving more operators to a single supervisor her work may easily become too great to be handled properly and as a result the service is bound to suffer.

It will probably be of advantage at this point to take up more in detail the duties of the various members of the office force in order to understand thoroughly the co-relation of each element that goes to make up the successfully operated central office. To the manager, as previously stated, is entrusted the entire charge and responsibility of the office and he is expected to produce results. In addition to exercising a general supervision over his subordinates the manager should pay particular attention to the individual operators in order that he may at all times be thoroughly posted regarding their capacity and their fitness for promotion to vacancies as they arise. It is also most important that the head of the office should be able to verify by inspection the correct assignments of the operators at the board, so that he may be able to prevent the placing of a medium or poor operator at a position which requires unusual care in handling.



IDEAL ARRANGEMENT OF CENTRAL OFFICE.

All complaints of service and requests for information that cannot be satisfactorily handled by subordinates are referred to the manager, and it is sometimes by no means an easy matter to placate an irate subscriber, who imagines that the operator has singled out his line and is determined to give him the poorest possible service. It is sometimes the custom to give the office manager jurisdiction over the wire chief and this practice has a number of features about it that are in its favor. In general, however, the maintenance and traffic departments are under separate heads, and where the personal relations existing between manager and wire chief are as they should be there can be no cause for a rearrangement of conditions. It often happens, however, that, due to conflicting ideas in regard to the clearing of the central office trouble, the manager and wire chief are placed on a footing that is far from friendly and a circumstance of this kind cannot but lead to a serious impairment of the service. The successful manager must at all times be courteous and diplomatic with the public, the maintenance force, and with his operators, although intimacy with either of the two latter classes is very liable to lead to serious trouble.

All reports to the superintendent must be examined and signed by the manager, as must also all of the work done by the clerical force, which is forwarded to the auditor. The selection of the chief operator naturally falls upon the manager and it cannot be too carefully considered before being settled, as the chief operator is in reality the pivot upon which the entire office swings. It is, of course, necessary that all questions of discipline be passed upon by the manager and that applicants for positions in the force should be sanctioned by him, and in addition all the operators' assignments should be carefully discussed with the chief before they are finally made.

The proper distribution of the office load is also a point that the manager must take care of; he should follow the loads on the different positions, have individual peg corrects made whenever it is felt that they are warranted, and should direct the wire chief in making such transfers of lines from one position to another as the position loads indicate. The load on the incoming trunks should be carefully followed and a note made of the number of times that all the trunks from any one office are busy and in consequence calls are delayed, and the same precautions should be taken regarding the sending trunks. Information of this kind will enable the manager to make intelligent recommendations for additional equipment and will give him positive data on which to base his requests. He should carefully observe the busy lines in his office and examine the record, showing the number of times a line is called for and found busy, so that he may be able to furnish the contract department with data upon which they may base their arguments when approaching a subscriber and recommending that he take another line or install a private branch exchange as the traffic may warrant.

A careful supervision of the trouble reports should be made at daily intervals in order that the traffic department should be in possession of all the information that may be necessary in order to properly follow up subscribers' complaints and locate the cause. The usual practice of obtaining a statement from the operator handling a position on which the line of a complaining subscriber is terminated is not in many instances liable to lead to satisfactory results, and if the manager keeps himself thoroughly posted regarding the operating ability of his operators, and also the condition of the lines from a maintenance standpoint, the task of locating a specific weakness in the service is considerably lightened and the result of the subsequent investigation rendered of real value.

(To be continued)

TELEPHONY AT THE WORLD'S FAIR.

Prof. W. E. Goldsborough, chief of the department of electricity at the Louisiana Purchase Exposition, recently had as a visitor Frank G. Carpenter, the well known traveler and writer, who interviewed Prof. Goldsborough on the subject of telephony, as exemplified in the exhibits at the fair, giving the results of his interview in the following words:

"I have spent to-day in the great Palace of Electricity talking with Prof. Goldsborough, who has charge of the electrical department. I have seen men telephoning without wires and even without the aid of the 'hello girl.' Yes! Actually telephoning without the intervention of her nasal twang, and without the danger of her pink ears hearing the secrets they transmit. They make their own connections and talk as long as they please, unbossed by her majesty.

"In my talk with Prof. Goldsborough I asked him about these automatic telephones. Said he:

"We have three different systems exhibited here. The Strowger system has been in process of development for a number of years, but it has only recently become thoroughly commercial, and it is now extensively used in the factory towns about Boston and Chicago. We have it here in the Electricity Building and use it in our business. The exchange is so arranged as to show the working of about 10,000 telephones. We have telephones at each of the various entrances of this building, in our offices, in the laboratory of the National Bureau of Standards and otherwhere. The system gives us a means of secret communication with one another, the central operator being eliminated. We can telephone what we please, and it is practically impossible for anyone else to know what goes on.

"In addition to this we have the Faller automatic telephone system, which has been so developed that it is now ready for commercial application on a large scale, and also the automatic telephone of the Bell company. The Bell Telephone Company has been quietly perfecting such machines for several years and it has its apparatus now on view in Section 17 of this building. This is practically the first announcement that has been made of it, and it is one of our most important novelties."

"Will such telephones come into general use?"

"I believe they will be used at first in small installations," said Prof. Goldsborough. "It may take some time to adapt them to the cities or to make it possible that they should take care of the enormous traffic of a large city without the use of operators. That is a matter of gradual development, and it involves serious engineering problems."

"How about the wireless telephone?"

"That is a new invention which is shown in a comprehensive way and on a sound engineering basis for the first time at this exposition. You can see it in the Palace of Electricity and listen to the transmission of articulate speech without wires. Prior to this demonstrations have been effected where the ground or currents of water have been used as a means of perfecting the circuit between the instruments. Here at the exposition we have an absolute divorcement of the transmitting and receiving instruments, one from the other, without any physical connection whatsoever.

"A person equipped with one of these telephone transmitters and the coil attached thereto can pass freely through the court and central aisles of this great building and distinctly hear the words spoken at the transmitting station, which is entirely out of view and far beyond ear range.

"The intent of this demonstration is to conclusively prove that the connection is absolutely wireless. We can easily show the general public that wireless telephone stations are installed and in operation, but it is difficult to make many believe that there is not some means of transmission between the stations. You can easily see that this could not be the case with the wireless telephone system exhibited here, as the person having the receiving apparatus in his hand knows that it is entirely free from any outside connection."

"Then the only use of this invention is to listen to some central speaker or to talk between man and man?"

"So far the system is used here only as a means of enabling one speaker to talk to a large number of listeners. Whether it will ever have a commercial value remains to be shown."

"How large an audience could one man address through one of these machines and be distinctly heard, Prof. Goldsborough?" I asked.

"As an engineering possibility it would be perfectly feasible to install such an apparatus so that one speaker could address at least 100,000 people, and each could hear him with equal distinctness. Such an experiment, however, would require the installation of a set of instruments which would be valueless in connection with any other kind of a demonstration."

XUM

Printing Telegraphy

DR. LOUIS M. POTTS

EVER since the original invention of the electromagnetic telegraph, inventors have been striving for a system of telegraphy which would print in Roman characters, and at the same time be rapid, and have as far as possible the simplicity of the Morse system. As far as practice is concerned, this result up to the present time has not been attained, but several systems are now being exploited which bid fair to overcome most of the disadvantages of former systems of printing telegraphy, for use in fields where, up to the present time, it has not been found practical to employ them. It is not the purpose of the present paper to give a treatment of the many printing telegraphs which have been proposed at various times, but rather to treat of the various essential principles involved in those systems which have been shown to be of value by their adoption in actual practice, or systems of recent invention which, although not in general use, involve essentially new and promising features. In all printing telegraphs there are four points which above all others require primary consideration. Of primary importance is the method employed to obtain a number of operations at a terminal station under the control of an operator at the distant station. Next in importance are the form of telegraphic current employed, the method of sending the signals, and the method of their reception in print.

DR. LOUIS M. POTTS.

SYNCHRONISM.

In practically all of the printing telegraphs which have ever been proposed, the control of a number of operations over one wire has been accomplished by the employment of synchronism in one form or another, and a good and stable form of synchronism is a necessary foundation for its successful operation.

The simplest form of synchronism employed was that used by Royal E. House in his printing telegraph invented in 1846. This is the so-called step-by-step method. In this system at the receiving station a toothed wheel is driven by a motor. As this wheel rotates, the current sent over the line is made and broken as each tooth passes under a contact. At the receiving station, the apparatus is likewise driven by a motor, and a toothed wheel is here employed similar to the one at the sending station, but in this case it is an escapement wheel. This escapement oscillates under the control of an electromagnet operated by the pulses of current received. As the sending toothed wheel rotates one tooth, the current is made and broken once, and the receiving toothed wheel is allowed to advance one tooth by a to-and-fro motion of an escapement. A key is provided by means of which it is easy to first set the wheels when the machines are first put in operation. The printing is always preceded by the operation of this key. As each succeeding key is depressed, the toothed wheel of the sending machine is allowed to rotate to the letter to be printed, and, in so doing, makes and breaks the current a number of times, corresponding to the number of teeth intervening, and these impulses at the receiving end allow the corresponding ratchet wheel to move the same number of teeth. This method of synchronism has the advantage of simplicity; but as it is often necessary to rotate the wheel nearly a whole revolution between succeeding letters, and as the mechanical parts must needs have considerable inertia, a limit is set to the speed at which the machine may be operated.

To the class of step-by-step synchronous motions also belongs the Buckingham. However, this method represents a great improvement over the method previously mentioned, particularly in regard to speed. The necessary number of steps has here been reduced to six for any character and always the same number. Each complete signal results in the advance of the receiving mechanism six steps in every case, the difference in the signals being merely different combinations of long and short impulses. And, further, the synchronism is rendered more positive by being reset after each character by the so-called release impulse. This will be clear from Fig. 1.

Another phase of the development of the principle of synchronism is exemplified in the Hughes machine. Here we have the method of first regulating two machines; so that they naturally tend to run at as nearly the same speed as possible, and then, at frequent intervals, correcting the rate of one or both by the amount they have deviated the one from the other. This idea has been extensively used, and variously modified since. Even the Hughes machine itself has employed several different methods at different times. In one form, the approximate synchronous motion of the sending and receiving machine is obtained by the use of two vibrating reeds or pendulums. These reeds or pendulums, by means of a ratchet wheel and escapement, regulate the speed of rotation of the type wheels. The rate of vibration of this pendulum can be regulated in the same manner as a clock-pendulum, by sliding a weight near to or farther away from the point of support. In another form, the approximate synchronism is obtained by a conical pendulum. This arrangement is similar to the ordinary engine governor. A heavy weight at the extremity of a long rod, pivoted at the extreme end, is rotated around its long axis. As it rotates, the weight is thrown out by centrifugal force and describes a circle of continually increasing radius. When this radius has reached a certain value, by means of a set of levers acted on by the weight, friction is applied to some part of the mechanism, and the speed prevented from going above a certain value. By regulating the position of the weight, quite a delicate regulation of the speed may be obtained. However, no matter how nicely such a mechanism may be regulated, they will continue in synchronism only for comparatively short intervals, so that it is necessary to have some means of accelerating, or retarding, the motion of one or both machines at frequent intervals. In the Hughes machine, this correction is obtained each time a character is printed. The type wheel is carried loosely, by friction on the rotating shaft, and rigidly to a so-called correction wheel, which has a number of notches equal to the number of characters on the type wheel. Each time a character is printed, a cam rigidly fastened to the printing mechanism engages the tooth corresponding to the letter to be printed, and turns the type wheel backward of forward, as may be required,

Paper read at the International Electrical Congress at St. Louis.

to bring it accurately to the printing position. Each time a character is printed this correction is applied. If the interval between the printing of two characters is too great, and the two machines get apart as much as one character, the wrong character will be printed and the machine will have to again be brought into unison.

In the Baudot multiplex system we have a system of synchronism very similar to the Hughes. But here we have a distinct improvement on the Hughes method, in that the synchronism is not corrected by the signals for the characters, but a separate impulse is transmitted over the line for the purpose of correcting the synchronism. The machine is

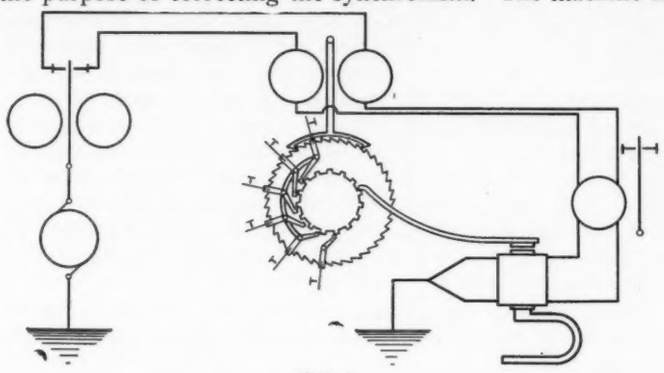


FIG. 1.

kept in continuous motion by a weight or a motor. The speed is locally kept very close to a definite speed, as in the Hughes, by a centrifugal governor, which, as the speed increases, causes the motor to do more work against friction, and thus keep its speed within a certain limit. The apparatus at one end is set to run slightly faster than at the other. Once in each revolution, or more frequently, the correcting impulse is sent out at the receiving station, by means of a commutator and rotating brush arm, which connects the line to the battery at frequent intervals. (See Fig. 2.) As will be seen on a part of the commutator (C_2), at the other terminal of the line, slightly in advance of that which sends out the correcting impulses, is a segment connected to the ground through an electromagnet. Assuming the brush B_2 to travel faster than B_1, it will arrive on the segment S_3 before B_1 leaves S_1, and the magnet E will be energized.

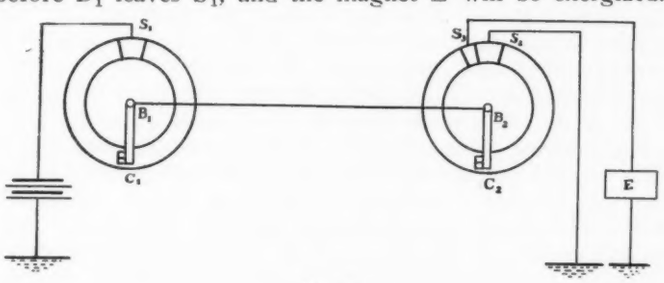


FIG. 2.

The magnet E operates a mechanical arrangement, which has for effect to set back the brush B a small amount, so that it again starts out in phase with B, and thus, at each revolution, the magnet E corrects the rotation by the slight amount it has shifted during the previous revolution. We thus have two systems in synchronous operation within certain limits of variation.

We now pass to a somewhat different type of synchronous motion in which, when in proper adjustment, the two tend to run at synchronous speed, and, if disturbed from this position, will tend to return, i. e., they are in dynamic equilibrium. In the Murray page printing telegraph we have an example of this form. As in the correcting systems, we have here at each station a vibrating reed, whose rates are made nearly equal by weights sliding along their length. These reeds vibrate against what are known as resilient stops, that is, stops which are not rigid but have a certain amount of elasticity. The effect of these stops is to allow a considerable variation in the period of the reed according as it is actuated by a weak or strong periodic force. This periodic force is produced by an electromagnet operating on the reed as an armature. In series with the electromagnet are two sets of contacts; one set is operated by the reed itself, the other set is on a relay operated by the line relay. This line relay has both front and back contacts so connected that the circuit of the reed magnet is broken each time that the line current is made or broken. If the breaks at both contacts occur at the same time, the reed magnet will receive its maximum current.

If, however, the two breaks occur at different times, the reed magnet will receive less current, and due to the effect of the resilient stops, as before mentioned, it will decrease its rate of vibration. If now the reed tends to go faster or slower, it will receive a less or greater amount of current, and will assume such a position that there is a balance between its tendency to go faster, and its tendency to receive less current due to its increasing rate.

The most perfect type of synchronism that has yet been devised is that used in the Rowland system of telegraphy. This is of the same general type as the Murray, but differs more particularly, in that the Murray is merely a synchron-

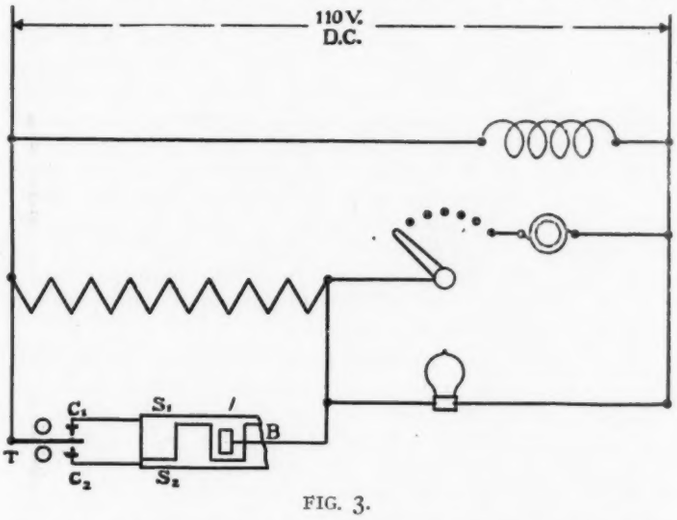


FIG. 3.

ism of vibration, while here we have the synchronous rotation of machines of considerable inertia and consequently a much more stable system, and one subject to disturbances to a correspondingly less extent. A number of different methods have been used in this system, all having the same fundamental principles, but differing considerably in the methods of their attainment. In the first place, a means is provided whereby two motors, when rotating in synchronism, are in dynamic equilibrium, and secondly, a means of producing a frictional force when they are disturbed from this relation. This can be best understood by reference in detail to a particular form.

The simplest form, and that used on the latest type of the Rowland machine, is that in which the principle is applied to two direct current motors. One motor drives the mechanism by means of which an alternating current is produced, in this case an alternating current of something over one hundred complete periods per second. The second motor drives a commutator for synchronizing. Referring to Fig. 3, we have the polarized relay R, which is kept in continuous vibration by the alternating current, produced by the mechanism driven by the motor at the originating station. The commutator C is kept in continuous rotation by the motor whose field and armature are shown. In series with the armature is a permanent resistance R, and a speed regulating dial. The commutator C is an ordinary crown com-

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mutator, having its alternate segments connected to the contacts of the relay. When the tongue T, and the brush B, are at the same time on the contact C_1, and the segment S_1, which are connected, the resistance R is cut out of the armature circuit, and it receives its maximum current. When they are at the same time on contact C_1, and segment S_2, which are not connected, the armature receives its minimum current. If now the relay R is so vibrated, and the commutator C so rotated, that as the tongue passes from C_1 to C_2 the brush B passes from S_1 to S_2 and as T passes from C_2 to C_1 the brush B passes from S_2 to S_1 and so on continuously, the resistance R will be permanently cut out of circuit. If, however, the brush is shifted the distance of one segment ahead of this position, the resistance R will be permanently in circuit. For any relation between these two extremes, the armature will receive at rapidly recurring intervals a larger and smaller amount of current.

The relation of the rotating brush and the vibrating tongue will determine the relative length of the interval of large current and of small current, and the integral effect will determine the speed of the motor, which, it will be seen, can have quite a large range. When the brush and tongue have such a relation that there are intervals both of large and small current, a tendency of the motor to increase its speed will call into action a tendency of the commutator to allow more or less current to flow through the armature, and the motor will assume a state of equilibrium where these two tendencies exactly balance. And, if the rate of this tongue increases, there is a corresponding increase in the current through the armature, until a state of equilibrium is reached and conversely. Such a system will remain in synchronism continuously for all ordinary variations, since such a state is a state of equilibrium, and, if disturbed from this state, it is acted upon by a force tending to return it. However, any freely moving system if disturbed from a state of equilibrium, will not return directly to that state, but, when allowed to return, will go beyond this point, and possibly make a number of oscillations about it.

Under ordinary circumstances, due to various causes, such a system is almost certain to be subject to many such disturbances, and may even continuously oscillate about its position of equilibrium. In order that such oscillations may be removed, it is necessary that some frictional force shall be called into action whenever such oscillations arise, i. e., the system must be made aperiodic, or nearly so. In this case, this result is very easily and quite effectively accomplished by having mounted on the motor-shaft a light but strong fly-wheel, having a large hollow rim filled with mercury. When the motor rotates steadily, this acts practically as a solid fly-wheel. However, when the speed changes the mercury drags or pulls on the outer wheel, and thus creates the frictional force necessary to dampen the oscillations when any disturbances occur. This also has the further effect to make the inertia of the system quite large, so that its period is so much slower than the alternations of the current, that the separate pulses, or even a considerable number, have no separate distinguishable effect on the speed, but only the integral of a large number, so that the modifications of the current caused by the signals have no effect on the synchronism, except as they may effect differently large blocks of waves. Practically, it is found that about half the waves require to be altered to have any serious effect on the stability.

CURRENT.

The basis of all electric telegraph systems is a succession of electric impulses sent to the point with which communication is desired. The character of these impulses has a most important bearing on the speed attainable by any system. In general, it is true that the speed will be determined by the number of impulses required for each signal, using as a unit the shortest signal, and counting each large unit in terms of the shortest. This is, however, very materially modified by other characteristics of the current. The principle effective consideration is the so-called trailing of the signals. This effect is not only produced by the electrical properties of the line, but is quite materially increased by the terminal main-line instruments. This effect is the duration of the action of a signal for a longer time than the length of the signal at the originating station. The line acting as a condenser, the other plate being the earth, takes up a certain charge, which, depending on its amount, prolongs the signal. This effect is still further increased by the fact that the iron core of the receiving relay holds its magnetism after the magnetizing force has been removed. This phenomenon exerts itself to a greater or less extent depending upon the duration of the signal. A long impulse charges the line more fully, and also magnetizes the core of the receiving relay to a greater extent, so that a very short impulse will have a less effective value at the distant station when following a long impulse, than when it follows a short impulse. These facts very greatly modify the speeds of different systems, having apparently the same number of unit impulses per signal, but which have different limits to the upper and lower length of the impulses employed.

In the simple step-by-step systems, the current consists simply of a succession of impulses of equal length which may alternate in direction or not. One long impulse for printing the signals is used; or the sending current is interrupted altogether, and the printing mechanism operated by purely local means. In this system we have a considerable number of impulses per signal, it being frequently necessary to rotate the wheel nearly a whole revolution. In addition, there is the length of time required for the actual printing, which, in many cases, requires even more time than the actual sending of the signal itself, since it requires the stopping and starting of parts having more or less inertia. For these reasons, any system acting on such a principle is limited in speed by the rapidity with which the mechanical parts can move.

In the Buckingham system, a decided step in advance has been made, and we have here a step-by-step system of remarkable speed. The speed has been increased by an extremely ingenious arrangement, by means of which six impulses are sufficient for any character. However, three of these impulses are short and three prolonged, so that the gain from this reduction in the number of impulses is not as great as might at first appear. The length of the long impulses being equal to three short ones, we have in reality from eleven to sixteen impulses for each letter, but, on account of the reversed polarity, and also on account of the fact that the longest impulses are equal to only three short ones, the current is well adapted for long-distance transmission. The speed limit has also been very ingeniously and materially increased, by the small inertia of the moving parts.

In the Hughes system, the current is extremely simple, being one impulse for each letter sent. However, a long interval ensues during which no impulse is sent over the line. We have here the fact that the wheel must in many cases be rotated nearly a complete revolution between successive letters, although, in certain cases, more than one character may be printed in one revolution. The speed of operation which has been possible with this machine, however, has not been such that the transmission of the line current enters seriously into consideration.

In the Baudot system, we have a much greater speed than that presented by the systems previously mentioned. The speed here has been greatly increased, due to the fact that the time element which enters into the step-by-step system, necessary for the actuating of the printing mechanism, has been entirely removed. The current at receiving station has merely to operate the light tongue of a relay. The printing is controlled by five relays and actuated by mechanical

means, so that the time required to operate heavy mechanical parts is not added to the time necessary to transmit the signals, but takes place simultaneously and independent of them. However, a part of the time of the line is taken up to maintain synchronism, which must be subtracted from the effective use of the line for actual signals. The Baudot signals are made up of units of five short impulses, which may be all in one direction, or any combination of six impulses in opposite directions. On account of this feature, it is possible to have very long impulses followed by very short ones in the opposite direction, thus bringing in the trailing effect mentioned above. We have two features which limit the speed of this system: the trailing of the waves, and the limit of the speed at which it is possible to maintain sufficiently stable synchronism.

In the Murray system, we have an alphabet practically the same as the Baudot, except that current only in one direction is used, the alphabet being made by the use of the various possible combinations of any number of impulses up to five, the remaining impulses simply being omitted. The same troubles enter into the transmission of this current as in the case of the Baudot. However, we have no added time interval for the purpose of maintaining synchronism. This is accomplished by the signals themselves. A limit is here set upon the speed by the operation of the punching magnet. Although it is possible to make such a mechanism operate with great rapidity, yet it is most likely that the limit of speed in this system will be found to be limited by this operation, and not by the failure of the signals.

The basic current in the Rowland system is an alternating current, the ideal current for long distance transmission. To transmit signals, it is necessary that the alternating current be modified. This is accomplished as follows: For each signal the base is a block of the alternating current, consisting of eleven half waves; these eleven half waves are modified by the reversal of any two. By this means, the alternating current is modified to a smaller extent than if more waves are reversed. There is an extremely limited amount of trailing of signals here, due to greater equality in the duration of succeeding impulses. As in the Baudot, the time element of the local printing mechanism is completely removed, it being purely local and controlled by eleven relays. As in the Murray, the synchronism is maintained by the signals themselves, and no deduction is made for the effective value of the line for the maintenance of synchronism. The speed at which it is possible to send by the Rowland system is only limited by the frequency of alternating current it is possible to use, and still receive sufficient current at the receiving station to actuate the main line relay positively, as no difficulty has been encountered in maintaining stable synchronism.

METHODS OF SENDING.

In the earliest printing telegraphs, also on the Hughes and Rowland, the messages are sent directly by a keyboard having a key for each character sent, and in the Baudot directly from a keyboard, but in this case having only five keys, and on this account requiring great skill for its operation. In many other systems, including the Murray and Buckingham, a punched paper strip, the invention of Bain, is employed. In both the Murray and Buckingham systems the preparation of the punched tape has been very much simplified by the use of a keyboard perforator, having a separate key for each character, the operation of which is very similar to the operation of an ordinary typewriter. This tape is prepared by one or more operators. The tape is then passed through a transmitter very similar to the Wheatstone. This method of transmitting presents the advantage of using the line to its fullest capacity.

In the Baudot and Rowland systems, the fact that one sending operator cannot send as fast as a line is capable of transmitting, is met by having several operators use the line at rapidly recurring intervals. In the Baudot there are two or three operators at each end, while in the Rowland there are four. The great skill required for the Baudot is not required in the Rowland, due to the use of a keyboard having a key for each character. These keys are locked and unlocked so that the operator can depress a key only at the proper intervals. The signals are transmitted at the proper interval by a commutator and rotating brush in connection with a transmitting relay. The keyboard simply completes the circuit through the proper segments of the commutator for the signal to be sent.

RECEPTION OF SIGNALS.

In the matter of the reception of the signals there is as great diversity as in the sending. In the simple step-by-step systems, the Hughes and Buckingham, the printing is accomplished by a prolonged impulse, which by means of a relay sensitive only to long impulses, either sets in action a mechanical printing hammer, or operates an electrical one. In the Murray system, we have at the receiving station, as well as at the sending station, a punched tape, which, after it has been prepared by the receiving apparatus, is passed through an attachment to an ordinary typewriter, which, by means of a set of ten levers, controlled by the holes in the receiving tape, allows, by means of a combination of slots, the keys of the typewriter to be depressed by a series of cams actuated by a motor drive.

In considering the practical value of any system of printing telegraphy, there are many points which enter into the question. Of course in the first place it is necessary that the system, both mechanically and electrically, shall be sufficiently stable and certain in its operation to be operated continuously under the conditions of commercial work. It must also, for the greater and most important class of telegraphic business, be capable of sending the messages in such a manner that there shall be the shortest interval of time possible between the actual receipt of the message in the sending office, and the delivery of the message at the receiving station. No matter how great advantages any system may have, if these conditions are not fulfilled, the system cannot be even considered for the greater part of the telegraphic business handled to-day, although an exceedingly rapid system, which did not fulfill the second consideration, might be employed for a certain class of business which is to-day conducted by the mails. (There are a number of printing telegraphs which have recently been invented that show extreme rapidity, but are not adapted to much of the present telegraphic business, but fill a new field, notably the Pollak-Virág and Siemens and Halske rapid systems.)

Aside from the two above necessary considerations, the usefulness of a system is dependent on the amount of business that can be transacted over one wire, and also upon the amount of business that can be transacted per operator, modified as may be necessary by the skill of the operator required. A very great point in favor of any system of telegraphy is simplicity, although this is not a necessity, provided that certain other conditions are fulfilled. If any system is shown to be reliable in its operation when supervised properly, the only point which really determines its usefulness is whether the cost of transmitting the message is reduced, as the determination of this cost per message should take into consideration any skilled employes who may be necessary to insure the continuous operation of the apparatus.

By considering the various printing telegraphs, with the above points in view, an idea of their comparative value may be obtained. The step-by-step telegraphs and the Hughes machine cannot seriously be considered for the transaction of any heavy business over long distances, since both the speed per operator and speed per wire are low.

In the Baudot machine we have a moderately high speed per wire, but not an exceptionally high speed per operator. The most serious objections to the Baudot are the great skill

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required for the operation of its keyboard, and the comparative difficulty of keeping it in stable and continuous operation, especially over many of the longer circuits.

The Murray system presents a high rate per operator, and also a comparatively high rate per wire. We have here, however, a serious objection from the fact that both the sending and receiving stations employ a perforated tape. It has been found in actual practice that a considerable delay is necessarily incident to the use of tape for this purpose. As it is necessary to perforate a considerable amount of tape before it can be actually used, this is likely to cause a delay of some minutes at both terminals. The greatest difficulty, however, is presented in the case of errors or damaged tape; in such cases it is always necessary to go back some little distance in the tape, and considerable delay is experienced in finding the error or disputed point on tape and to transmit it again over the wire.

In the Buckingham system we have also a high speed per operator, and a comparatively high speed per wire, although probably not as great as in the case of the Murray. However, the Buckingham system presents a decided advantage over the Murray from the fact that the punched tape has been dispensed with at the receiving station, and is used only at the sending station. The use of tape at the sending station causes considerable delay, but not as much as in the case of its use at both stations, as the errors are detected much sooner. The Buckingham system would also in actual practice probably gain somewhat on the Murray, due to the fact that its operation would be more stable, as there are no reeds to tune at the terminals of the line, but the motion is a positive step-by-step action.

In the Rowland system, there is a large speed per operator, possibly not as great as could actually be obtained on some other systems, such as the Murray and Buckingham, but it is to be expected that in practical work the sustained rate of the Rowland operator would be practically the same as that of the Murray or the Buckingham. The speed per wire is much greater than that of any other printing telegraph system, and is greater than that of most other automatic systems, if we except the chemical. In the Rowland system, both sending and receiving are direct, and neither requires the services of a skilled operator. The time of delivery of the message has here been reduced to the minimum possible with an automatic system, and, by the aid of the several special contrivances, the correction of errors or inquiries in regard to messages has been reduced to the minimum. It is possible in this system to stop an operator in the middle of a message, and have the message duplicated, without the sending of a service message. The objections which have always been made to the printing telegraphs employing synchronous motion have been almost completely removed by the employment of stable synchronism, and also the furnishing of a means whereby synchronism can be established in less than one minute. On account of the direct method of operating the Rowland system, and also on account of its large capacity, a larger amount of mechanism is required than in the case of systems of smaller capacity. This feature has resulted not so much in great complication as in the multiplicity of parts.

The subject of printing telegraphy presents so many phases, and the demands of the telegraphic business are so varied, that no one system is likely to be adaptable to all needs. It would appear evident from the good showing of the several recently invented printing telegraphs, that the adoption of printing telegraphs for general telegraphic business in America is imminent, and that the same machines will be used side by side with the printing telegraphs already employed in Europe and will in many cases completely replace them.

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TABLE OF SPEEDS.

	Messages of 20 words each per hour. Theoretical speed.	Maximum theoretical speed. Words per minute.	Practical speed (telegrams, 30 words) per hour.
Morse quadruplex ...	...	...	188.8[8]
Hughes simplex	72[1]	21	40[7]
Hughes duplex	144[1]	42	80[7]
Baudot simplex	112[1]	35[3]	40[7]
Baudot duplex	224[1]	70[3]	80[7]
Baudot quadruplex...	...	140[3]	160[7]
Baudot sextuplex.....	...	210[3]	240[7]
Wheatstone simplex..	240[1]	...	...
Wheatstone duplex...	480[1]	...	...
Murray simplex.....	...	96[4]	120[4]
Murray duplex.....	...	192[4]	240[4]
Buckingham simplex..	...	100[5]	100[5]
Buckingham duplex...	...	200[5]	200[5]
Rowland single.....	162[2]	47	60[6]
Rowland octoplex....	1,296[2]	376	480[6]

NOTE.—In the preparation of the above table, the author has encountered serious difficulties in getting the speeds of the various systems under comparable conditions. It is believed, however, that the table gives as nearly the comparative values of the various systems as it is possible to obtain, until more data has been furnished by a more extended practical use of certain ones included in the list.

1. See "Valore Comparatiro dei Sistemi Telegrafici usati in Italia," by Z. Ferranti. Roma, 1893.

2. These calculations have been made by the author based on same assumptions as above and for messages received on a continuous band, as in the case with Hughes and Baudot.

3. These figures are based on the maximum speed 192 revolutions.

4. See "A New Page-printing Telegraph," by W. B. Vansize. Transactions of American Institute of Electrical Engineers, Vol. XVIII.

5. See *Telegraph Age,* Vol. XIX, No. 17. "The Buckingham Long-Distance Page Printing Telegraph," by Wm. Maver, Jr.

6. These figures are actual performances over real lines under commercial conditions personally observed by the author. The messages received on telegraph blanks ready for delivery.

7. These figures are the result of information collected by the author from various reliable sources and are intended to represent as nearly as possible the comparative values of the systems under actual conditions. In each considerably greater speeds are actually attained, but are not maintained.

8. Mr. F. W. Jones in Vol. 39, *The Electrical World and Engineer.* This is highest average claimed for the Morse Quadruplex for a full day's work on the line of the Postal Telegraph-Cable Company between Boston and New York.

QUESTIONS AND ANSWERS

Conducted by J. C. Kelsey, Purdue University, Lafayette, Indiana.

Can a grounded line be put on the same poles with a metallic circuit without causing cross-talk or disturbances? If so, where should the transpositions be made?—E. B. S., Wyoming.

On general principles, the metallic line, if comparatively short, would be free from cross-talk, with one transposition in its middle point. If the instruments are strong talkers, designed for extremely long hauls, one transposition would hardly suffice. It is a good plan to transpose the metallic line at regular intervals of two miles, which is sure to prevent any mutual disturbance. A second metallic line could be constructed, and transposed every mile, and the third every half mile. I have operated lines 125 miles long, transposed in two and one-half mile lengths, and never detected cross-talk.

Please explain why Brush and Thomson-Houston arc light machines cause more disturbance upon a McCluer magneto telephone system than a Westinghouse, Western Electric or Wood machine. I have heard this claimed by good authority and I would like it explained.—G. W. L., Wisconsin.

There are numerous return systems that will bear witness to the claims of the authority stated. There are two general types of arc light machines, of the old series direct current type. One was the open coil armature type, like the T.-H. and the Brush, and the other, the closed coil type, like the Wood Western Electric. The Westinghouse machine does not come under these types, as it is primarily a two-phase, alternating current generator, equipped with a rectifier, which converts the alternating currents into unidirectional, but not absolutely continuous currents. When one phase of the machine is at its highest pressure value, the other phase is at its lowest, so that an average pressure is obtained, which is comparatively smooth—not exactly smooth, but slightly varying, or pulsating, which gave to the Westinghouse system an advantage of not having sticking moving lamp parts, owing to the naturel vibration set up. The regulation of the constant current machine is in a class by itself, being purely electrical, and superior to the sluggish mechanical means usually employed. The machine is made with an abnormally high inductance, so that all changes in the amount of current flowing are resisted, and giving a five per cent regulation. This two-phase machine may be compared to a locomotive, which we all know has two engines, with engines set at quarters. If the engine had one cylinder, there exists a chance for a dead center, and at stations the passengers will have the sensation of being started with crowbars. If the load were heavy, the single cylinder engine, being helpless twice each revolution, would depend upon the momentum of the train to push over the centers. The passengers, possibly, would be aware of a disagreeable jolting motion. With another engine, set at quarters, it would be in a position of greatest power at the time of the helplessness of the first engine. The dead center danger is eliminated, and the load carried smoothly, for the pull does not vary from zero to maximum, and rather has a value close to maximum all the time.

The Brush arc machine is of the open coil type, and has from four to sixteen armature coils. If the Brush machine, generating 2,000 volts, has eight coils, there will exist a rise from zero to 2,000 volts and reverse four times each revolution. But the commutator is so arranged that the bars overlap, and the abrupt changes are smoothed down, though not in a great degree. This is shown by the sparking at the brushes, which is not violent, and can be kept normal by automatic brush shifting. But the changes are bound to be violent, and in an eight-coil machine, it might be said that the voltage would range between 1,500 and 2,000 volts, or twenty-five per cent regulation, which would play havoc with the telephone receiver.

The Thomson-Houston is the worst machine from the telephone standpoint, as the pressure of the circuit is completely raised and lowered through its maximum six distinct times each revolution. It is an open coil machine, with three coils on the armature. Owing to the short-circuiting action of the armature six times each revolution the stored up energy in the circuit shows itself in the form of a vicious spark at the brushes, which would destroy the commutator were it not for a device that automatically blows out the spark at the proper time. To realize the importance of the blowing out, one has but to break a blower stem, and watch the flames that come from the discharge of the circuit.

The Western Electric arc is a closed coil machine, with the armature coils in series, adding pressures and giving out a smooth current. The only fluctuation would be the change when a commutator bar passes under the brush. Assuming twenty volts drop between coils, the change in a 2,000-volt machine would only be one per cent. The Wood is also a closed coil type, and has a great number of coils on its armature. The output is smooth, and the change is less than one per cent. The regulation is accomplished by mechanical shifting of brushes, and demagnetizing the armature according to the output. At full load, the demagnetization effect is at its minimum, while on short-circuit the demagnetization effect is at maximum, and no pressure could be generated.

The only absolutely quiet condition of paralleling power wires would be that where constant pressure and constant current exist. This condition can be realized in a storage battery. Fifty thousand volts from a battery could exist on the power line, but no sound would be heard on the telephone lines. Induction is a matter of alternating or changing currents and pressures. If no changes take place in a power circuit no charges are induced, and no noise would be heard on the worst unbalanced line, or even grounded line.

If the Wood arc machine took the place of the storage battery, with pressures and currents the same in value, a little noise would be heard in the unbalanced common return line, because small charges are induced by the slight changes, and the charges, in coming to equilibrium, cause currents of charge to flow through the bridged telephones, and noise is heard.

If the Western Electric machine took the place of the Wood a little louder noise would be heard, as the machine has fewer commutator bars than the Wood. There would be slightly greater difference in the pressure changes, and the induced charges slightly greater, which would result in a greater current of equilibrium passing through the bridged receivers in a badly balanced return circuit.

The Westinghouse arc would indicate to the listener a little more noise than the former conditions, because the pressure is not so steady. It pulsates between greater limits, and would possibly be 1,700 to 2,000 volts. Here would

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result greater induced charges, as the pressure varies between greater values, and the currents from the charges would be greater, and more noise would be heard.

The Brush arc causes a greater noise, because the changes are more violent, having a greater range in pressure. As the induction depends upon the rate of change and the amount of the potential the amounts of the charges will be considerable, and the noise would be nearly as bad as if a 500-volt alternating current were causing it. The alternating current would make a musical tone, while the noise from the Brush arc would be violent, because the changes are more abrupt, from brushes passing off of the commutator bars.

The T.-H. gives the worst disturbance. Six times each revolution the potential of the line falls abruptly to zero, all the way from 2,000 volts. Six times each revolution the charges on the telephone line, induced by 2,000 volts, would come to equilibrium in the circuit, and six times each revolution of that machine the telephone receiver would detect the large current resulting, and as a result, the great sputtering, tearing noise would prohibit any other note.

If all arc circuits, either closed or open coil, were arranged to pass in the neighborhood of telephone leads metallically—that is, the current in one wire pass back over its twin—then the disturbing charges would be neutralized in the wires themselves, and no noise would be heard if the insulation of the much fluctuating line is in the best condition. If the insulation were poor, or aground at one or more places, charges would then be induced upon the telephone lines, with a potential higher than that of earth, which would cause them to seek the earth at the weakest spot of the system. If the return system is grounded at the office, it will carry off the charges, and make the lines noisy in the vicinity of the electric light line. If the insulation were good, it would be best to open the ground wire. If insulation of return system is poor all over, then a ground at central will localize the few troubled lines, and prevent the untroubled lines from being subjected to a strain, which in their weakened condition might become noisy, because they offered a good path to earth. A good ground would protect them.

The tendency is now to establish series alternating arc service. As the changes are uniform, the noise is not very disagreeable, as in the case of the open coil machines, which open the circuit at regular intervals. The same precaution of doubling back when passing a telephone lead should be observed. Also, the lighting company should be compelled to look well to the insulation of its own lines.

In Fig. 1 how much current will flow from the machine to the step-up transformer A, thence to B, the step-down transformer, and thence to lamps? The machine generates 100 volts and is transformed to 1,000 volts; current is carried five miles, stepped down to 100 volts, and distributed to 150 16-candle power lamps. What size of wire is necessary?—C. A. H., Maryland.

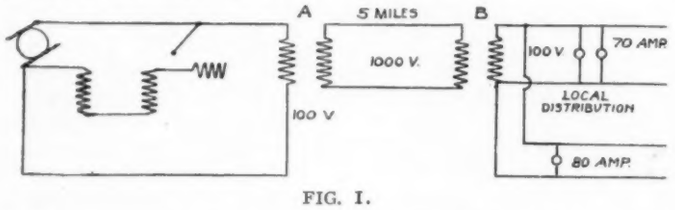

FIG. I.

The current in the generator circuit will be 150 amperes. The compensation for losses is made in the pressure, so that instead of 100 volts, one might expect about 105 volts. Three incandescent lamps require 150 amperes, which we will assume is furnished by the distant generator at five per cent loss. The distribution loss will be two per cent in the lamp circuits. The efficiency of the transformers is ordinarily three per cent. Now the distinct advantage of alternating current is the ease of transformation. Large currents at low pressure can be transformed into small currents at high pressures, and great saving in wire is accomplished.

First we shall consider the transmission done by means of direct current at five per cent loss. There is a formula, given in Foster's handbook, which is as follows:

$$\frac{\text{Constant} \times \text{Distance} \times \text{Watts}}{\text{Percentage Loss} \times \text{Square of Pressure}} = \text{Circular Mils.}$$

The constant for direct currents is 21.6, which is the resistance of one foot of wire, one circular mil in diameter. In the formula, the constant is used 100 times its value, as in the denominator; the percentage loss is taken as a whole number instead of a fraction, for five is 100 times .05.

$$\frac{2{,}160 \times 26{,}000 \text{ feet} \times \text{Watts } (150 \times 100)}{5 \times 100 \times 100} = 16{,}848{,}000 \text{ CM.}$$

This means eight feeders in parallel, one inch in diameter. But the current has to flow back over same size wire, hence such a system would require 32 wires, each one inch in diameter, weighing about a pound and a half to the foot, or $32 \times 26{,}000 \times 1\frac{1}{2}$, or 730,000 pounds of copper, which at 12c a pound would amount to nearly $100,000, besides the extra pole line and cost of construction. Such a plant would be unreasonable, as the revenue from 300 lamps would not exceed $3,600 a year.

But on an alternating current basis the cost comes within reason. Of course, 10,000 volts would be cheaper than 1,000 volts for five miles at five per cent loss, but 1,000 volts is the question. If the transformer loss is three per cent, and the distribution loss two volts, and the ratio of transformation ten to one, then the voltage existing at the terminals of the primary side of the step-up transformers will be

$$\frac{(100 \text{ plus } 2) \text{ times } 10}{.97} = 1{,}051 \text{ volts.}$$

The watts are equal to 150 times 100, or 15,000 watts. As there is a loss of three per cent in the step-down transformer, and two per cent in the distribution line, the total watts would be

$$\frac{15{,}000}{.98 \times 97} = 15{,}780 \text{ watts.}$$

According to formula, the circular mils are

$$\frac{2{,}400 \text{ (alternating constant)} \times 26{,}000 \times 15{,}780}{5 \times 1{,}051 \times 1{,}051} = 178{,}000 \text{ CM.}$$

One hundred and seventy-eight thousand circular mils represent a 000 wire, which weighs about half a pound to the foot. Fifty-two thousand feet at a half-pound per foot at 12c a pound would cost over $3,000, which, including a lighter pole line and less construction difficulty, is much more reasonable to install than direct currents.

Suppose you concluded to use 10,000 volts. The primary terminal pressure of the step-up transformer would be

$$\frac{(100 + 2) \times 100}{.97} \text{ or } 10{,}515 \text{ volts.}$$

The watts to be transmitted are still 15,780, and the only change would be in the denominator of the formula. Instead of squaring 1,051, the expression 10,515 is squared, which at a glance reveals a much smaller sized wire necessary.

$$\frac{2{,}400 \times 26{,}000 \times 15{,}780}{5 \times 10{,}515 \times 10{,}515} \text{ or } 1{,}700 \text{ circular mils.}$$

This corresponds to a No. 17 wire, which is, of course, too small to hang up on poles. However, carrying out the formula, to transmit 15,780 watts five miles at five per cent loss, at 10,000 volts pressure, would require a wire weighing six pounds to the thousand feet, or 320 pounds, which at 15c

would cost $48. This would be slightly offset by increased cost of insulation, and high tension transformers.

There has been a great deal of talk about standardization of construction and apparatus for Independent interests, but I have not been able to learn what has been done in that direction. We are forced to rebuild our plant, with 350 local battery subscribers, on account of the new light and railway power house built in our city. Tell us what has been done, and what companies make standard apparatus.—J. F. D., Missouri.

Nearly every manufacturing company turns out standard apparatus. The question is not with them, but with the operating interests that order apparatus. If you order a system, which makes use of a series drop, when connected will toll lines, the fault is not with the manufacturer, but with you. The series drop may be standard in every sense of the word. Standardization was not dreamed of before toll lines connected the various Independent systems. Each and every man followed local conditions, and was successful. But when toll lines entered into the arena, new conditions arose. It was found that the toll line could not be connected with on the same simple local condition basis. A long toll line may be said to be particular about its associates. It will not work in harmony with any device that does not have its characteristics. Its characteristics are its metallic wires, of equal size and resistance, its fine insulation, and its transposition, which individualize it and protect it from all extraneous currents. If connected with a line, poorly insulated, grounded on one side, or connected by means of a cord circuit, with series drop, all these characteristics are upset, and the line made no better than its local connection. Hence, poor long-distance service.

A long toll line will work in harmony with a local line, if the local line is metallic, well insulated, and protected from disturbances, by being properly transposed and balanced. The cord circuit should contain a bridging clearing out drop, 1,600 ohms anyway, which will not unbalance the connection, or absorb any of its energy. There should be no repeating coil necessary, as that absorbs twenty per cent of your energy, being designed for both ringing and talking. Therefore, I claim that fundamental standardization is that combination of construction and equipment that will give any subscriber of your system perfectly satisfactory telephone service with another subscriber connected by a pair of No. 10 copper wires 300 miles distant. If Lafayette had a telephone system, standardized for 300 miles transmission, the subscriber could talk to Chicago, St. Louis, Milwaukee, Cincinnati, Indianapolis and Louisville. These cities within this 300-mile radius would get 95 per cent of the long haul business. It would hardly be necessary to attain a higher standard.

Independent transmitters, coils and receivers are good enough for any transmission. The reason that so many long-distance connections fail is the lack of a direct circuit, or the use of a noisy circuit. If the circuit is direct, without intermediate repeating coils, with but three or four high impedance bridging clearing out drops across the line, and the local line is well balanced and insulated, there is no reason why the absolutely quiet line will not permit any transmitter to give clear transmission. Two repeating coils, designed for both ringing and talking, will spoil the transmission, and so will an inductive noise of even small amount make the two 300-mile distant subscribers seem as if 1,000 miles apart.

UNDERGROUND CONSTRUCTION.

The telephone conduit system at Dallas, Texas, is completed.

Extensive undeground construction is in progress at Columbus, Ohio.

Thirty thousand feet of underground conduits for telephone wires are being constructed at Waterbury, Connecticut.

The underground conduit system at El Paso, Texas, has been completed.

At Westbrook, Maine, all telephone wires are being installed in conduits.

The Ypsilanti (Mich.) Home Telephone Company has begun laying conduits.

Work is progressing rapidly on the telephone conduit system at Keokuk, Iowa.

Nearly all the telephone wires in Peoria, Illinois, have been placed underground.

The telephone and telegraph wires in Chester, Pennsylvania, will be placed underground.

The Inter-State Telephone Company will install an underground system at Auburn, Illinois.

All telephone wires in the business district of Oakland, California, are being put underground.

The telephone wires in the business part of Little Rock, Arkansas, are to be placed underground.

The city authorities of Racine, Wisconsin, have ordered all the telephone wires placed underground.

A considerable amount of underground work has just been completed at Pittsfield, Massachusetts.

The city council of Omaha has issued a mandate that all telephone wires must be placed underground.

The Northern Illinois Telephone Company is laying a number of its cables underground at Aurora.

The Inter-State Telephone Company recently completed an extensive job of conduit laying at Springfield, Illinois.

The Delmarvia Telephone Company at Wilmington, Delaware, is placing all of its wires underground, employing 200 men in the work.

The People's Telephone Company is installing a large amount of cable service in various parts of Knoxville, Tennessee. The cables have been put in underground conduits.

The city council of Paducah, Kentucky, has passed an ordinance requiring all telephone and electric wires, except the trolley, to be placed underground within a required time.

The Los Angeles city council is making arrangements to have the underground telephone and telegraph wire district enlarged and to see that all of the companies put the wires underground in that district.

The Pine Bluff (Ark.) Telephone and Telegraph Company will erect a new exchange building and will place the majority of its wires underground, after which it is probable new exchange equipment will be installed, all at a cost of $100,000.

The city authorities of Sioux City, Iowa, having succeeded in getting the wires of the telephone companies underground, are now determined, if possible, to have the wires of the traction and gas and electric companies put in underground conduits.

TO BUILD IN INDIANA.

The National Telephone and Telegraph Company of West Virginia has been admitted to Indiana, and the company has filed a certificate of incorporation and a declaration to invest $175,000 in the building, equipping and operating of telephone exchanges, toll lines, etc. The company also proposes to lease or connect with other telephone plants owned or operated by other individuals or corporations. The company's principal office will be in Fort Wayne, and in charge of William L. Moellering, who has been selected as state agent. The Indiana stockholders are Frank H. Cutshall, William Paul and George T. Cox of Fort Wayne.

Elgin, Illinois, claims to hold the telephone record, there being one telephone for each ten people in that town.

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Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

TRUTHFUL ❧ FEARLESS ❧ INDEPENDENT

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USE OF TELEPHONE IN VOTING RESULTS.

THE result of the presidential campaign of 1904 was made known to the people throughout the United States more quickly than in the case of any previous election in the history of the country. This was due less to any marked improvement in the speed of counting votes and making returns than to advances made during the past four years in the promptness with which results can be distributed. It was due particularly to the remarkable extension in the use of telephone, by the spread of the Independent movement. From thousands of cities, towns and villages in all parts of the country—in fact, wherever a telephone exchange exists—come reports of the complete and superior manner in which the telephone companies handled the election returns and furnished their subscribers, as well as the general public, with the desired news from near and far. As was to be expected, the Independents led in this particular, in nearly every instance distancing their rival in the matter of prompt and dependable service, having the aid of the Associated Press and other great news-gathering agencies.

Election night is always a "rush" period with the telephone companies on account of the tremendous number of private messages that go over the wires, and the fact that the telephone company officials are preparing to furnish the national, state and local returns in addition, involves a great amount of extra work and a careful system of organization to avoid the hopeless congestion of the wires. The officials of long-distance organizations say, however, that this preparatory work was so thorough that any one of the subscribers in their respective systems could have the results sent to him promptly by notifying his "central" in advance. In instances without number those who have telephones in their homes dropped casual invitations to their friends to "come around election night and get the returns by telephone." There were many thousands of these telephone parties scattered throughout the country on the evening of November 8.

All this is more wonderful than a bare recital of facts makes it appear. In the big cities where the newspapers displayed continuous bulletins it did not make so great a difference as in the smaller towns and rural districts, though even there many persons found it more pleasant to sit in their own houses and hear the news than to join in the noisy, jostling crowd, where the telegraph offices closed early or where, if they remained open, the receipt of news was dependent upon the members of the state or county committees' remembering to notify the town committeemen. In the country communities, in particular, the new method of obtaining the results found special favor. It was a particular boon to the farmer and his family, four or five miles from the nearest village, provided his telephone was in a system connected with long-distance lines.

The telephone is almost as essential a part of the equipment of the up-to-date farm as the sulky plow or the self-binding harvester. The plans were so made that the families in all these scattered farmhouses, perhaps 1,000 or 1,500 miles from the point where the information was gathered, were made acquainted with the result practically as quickly as the members of the national campaign committees in New York or Chicago, or the candidates themselves.

Each of the presidential candidates learned by telephone of his victory or defeat. President Roosevelt, unlike his distinguished recent opponent, dislikes to use the telephone himself. In the executive offices at the White House, where he was on election night, the president had the services of both telegraph and telephone operators and he received many messages from his campaign managers over the "speaking wire." A similar situation existed in almost every state, for it has come to be the established custom for nominees for governor, for congress and for other offices, to

receive the news at the end of the wire leading from their homes to the party headquarters.

It is not only in making known the results of elections, but in preparing for them and in carrying on all kinds of political work that the handy instrument which annihilates space and makes time stand still, has come to play a leading part. In no previous campaign has the telephone been utilized to anything like the extent it was in the late one.

"The telephone has revolutionized the methods of conducting almost every kind of business within the past decade," said a national committeeman who helped manage the presidential campaign for one of the two great parties. "But it has made greater changes in politics than in almost any other kind of business. Yes, politics is a business, at least the running of political campaigns is, and it is to that that I refer particularly. Politicians are greater users of the telephone than any other class of men, unless it be the Wall street brokers, and the telephone has many advantages over any other method of communication from their point of view. It is prompt—no time lost in transmitting orders—it is direct, and it is secret—you can never be certain of absolute secrecy in the case of written statements which may come up to bother you at the most inopportune time.

"The use of the telephone in political campaigns received a great impetus in 1890 when Senator Hanna sometimes held conversations with men in a dozen different states in the course of a day when the situation demanded special attention. President McKinley, too, was a great admirer of the telephone and a great user of it. One incident in connection with it which greatly delighted him is interesting as showing the possibilities of the telephone in politics.

"It was at the time of the St. Louis convention in 1896. The nomination of McKinley was a practical certainty, but naturally the prospective nominee was anxious to keep in as close touch as possible with the proceedings in the convention hall. The telephone officials offered to make arrangements in McKinley's home in Canton so that he could actually hear the proceedings of the convention. This was done and Mr. McKinley, sitting quietly in his parlor, heard a part of the nominating speeches and listened to the tumultuous applause that followed his selection as the candidate, with what feelings we may imagine. This is the only instance where a presidential candidate ever heard himself nominated, when he was hundreds of miles from the city in which the nomination was made, but later on in the same campaign Senator Hanna and other officials of the republican national committee in their rooms in New York heard the music of the bands and the cheers of the great sound money parade in Chicago.

"In the recent campaign George B. Cortelyou, who conducted President Roosevelt's canvass, had a system in everything and in that system the telephone played an important part. At the democratic headquarters Chairman Taggart was such an inveterate user of the telephone that the newspaper men dubbed him 'Telephone Tom.'

"It is curious to note some of the changes that the telephone has brought about in politics. For instance, it has practically killed the roorback. In the days before every town was in immediate touch with every other part of the country, a campaign lie started a day or two before election could not be denied in time to reach all the voters and in a doubtful state it might change enough votes to decide the election. Nowadays that is impossible, because any local committeeman can call up a candidate or the central committee at almost any hour of the day or night and the campaign lie is killed before it fairly gets started.

"Another important effect has been the centralization of campaign work. In the old days the county committees sent in their reports to the state committees and the latter sent their reports to the national organization a fortnight before election day and that was the latest information these bodies had to go on. Now, anybody knows that the situation may change completely in two weeks, and there were some big surprises when the votes were counted. As it is now, the state and national chairmen kept in close touch with their local representatives right up to election day and it has become possible to run the campaign more efficiently and to forecast the results more accurately, and all because of the telephone and the widespread use to which it has been put by the Independents. Four years from now there is good reason to believe that the campaign will be conducted almost entirely through the medium of the press and the telephone."

SCIENCE VS. COMMON SENSE.

A MAN of unique personality in the telephone business once said, "Hereafter this corporation is going to be run on the basis of common sense and arithmetic, instead of blue prints and the higher mathematics." Nearly everybody who has struggled with the bombastic laborings of a certain class of theoretic economists will experience a thrill of fellowship at this, and be inclined to endorse the spirit of the criticism, even while acknowledging that there are some things which require a little more than arithmetic for their solution.

There has seemed to be something of a quarrel between science and common sense, but on analysis it is likely that this is only rumor, and that actually the two elements are quite at peace; for, after all, it is trite to say that "knowledge is power." It is to be admitted that science in the real sense is only classified knowledge. To possess a mental storehouse filled with a jumble of more or less accurate information is not to possess the ability to reason logically and soundly, to apply to a given conditions those elements which are applicable, and to reject those which have no bearing.

An eminently practical manufacturer has lately said that it is in the power of the human mind, after performing in more or less systematic and conventional ways, to stand off and look at the result and ask one's self whether they are reasonable. One man will figure that certain material weighs 200 tons and believes it; another will say, "There is something wrong in that, for it all came on two freight cars." There are certain people who realize the difficulty this gentleman refers to, and it is a person of that class who says he "would rather have the practical man's guess than the engineer's calculation."

The telephone business is a remarkable instance of gaining knowledge by experience and applying it toward immediately useful ends. Until recent times almost nothing about telephony was capable of being calculated with accuracy. The good results of the future, however, are going to come from the same patient and persistent labor which has made success in railroads and in banking, and while it is conditions and not theories which confront us, common sense and science working together constitute the team to pull the load.

ON PROSPERITY'S WAVE.

NOW that election is over and the great American people have settled the presidential question for another four years, there is sure to be unprecedented activity in the ever-widening Independent telephone field, which will find expression in the building of local telephone systems and long-distance lines in all parts of the country. As in all great political campaigns there was a falling off in business of all descriptions, which condition was most pronounced in the six months previous to election, and was felt up to the last moment of the campaign.

While there is more money in the country to-day than ever before, and there is no denying that these are pros-

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perous times, yet the condition has obtained for months past of capitalists and the investing public in general hesitating about embarking in new enterprises (owing to the probable uncertainty of business affairs in case of a change of administration), and allowing vast sums of money to accumulate in the banks of the country, much of which otherwise would have found its way into the channels of industrial development. To a certain extent the Independent telephone movement felt the effect of this business stagnation, and in instances without number, capital was withheld from telephonic enterprises that, but for the dulling effect of a political campaign, would have been pushed to successful completion.

The building of minor Independent systems, let it be known, has gone steadily ahead the past year, but it is in connection with the really big enterprises that the campaign blight has been felt. Capitalists and promoters, with unlimited funds at their command, and chafing to forward gigantic telephonic plans, particularly the construction of long-distance lines to connect the east and west—this was the condition that prevailed. The manufacturers felt the depression, as also did all those in any way connected with the Independent telephone business, and the close of the political fray, with its election assurance of continued prosperity and unshaken industrial and financial conditions, has caused great satisfaction among Independent financiers, manufacturers and operators. The reflex action has already set in and is to be observed in the hastening of work on enterprises already under way and the promulgating of plans for still other big telephonic undertakings.

If the Independent movement has made favorable progress in the past it will now go forward by leaps and bounds and the next year will mark the greatest strides in Independent telephony in its history. The value of Independent securities from an investment standpoint has become so thoroughly established and well known that there is now a rush to secure the coveted bonds, and no difficulty is found at the present time in financing telephone deals, no matter how pretentious. The experimental period in Independent telephony is past; the day of the full triumph of the great movement is at hand. The harvest will be a bountiful one for both promoters and manufacturers.

TELEPHONY counsels continued harmony in the ranks of the Independents, better organization in state and district, fealty to the national body, and an earnest endeavor on the part of every telephone company, both large and small, to give the best possible service, at reasonable rates. There can be only one outcome to this policy, if fully carried out, and that is—the complete success of the Independent movement. And that time will come when there is a telephone in every home in the land—a Utopian state of affairs to be sure, but admittedly the mission of the Independents and one which is bound to be accomplished in spite of all opposition.

GREAT GAINS IN IOWA.

THE telephone has certainly taken a great hold upon the people of Iowa, where the Independent movement is going forward by leaps and bounds. It is doubtful if any other state in the Union can show greater progress along telephone lines than Iowa; and this applies particularly to the gains made the past year.

The mileage of telephone lines in Iowa increased three and one-half times during the first nine months of 1904. Whereas in 1903 it was 14,043 miles, in 1904 it was 48,491 miles. The prinicpal increase was in the rural lines, a large majority of which have been constructed by the Independents. This is the reason that the assessment recently made by the executive council of the Hawkeye state did not keep up proportionately with the mileage increase.

The total of the assessment of the past year was recently announced. The property was valued at $8,808,126.76. This includes telegraph lines also, which, however, represent less than one-half of the property valuation. Last year the council valued the lesser mileage at $7,797,487.16. This increase of $1,010,539.60 represents the increased mileage of the simple, rural lines. The taxable value of the properties as fixed this year follows:

Telegraph companies, 10,023 miles	$730,286.23
Commercial telephone lines, 30,437 miles	1,261,023.94
Rural telephone lines, 18,054 miles	210,695.52
Total assessment, 58,514 miles	$2,202,006.69

Last year the mileage was 24,086. The telephone miles of the two years, therefore, was 14,043 against 48,981—a showing of which the Independent telephone interests of the state may well be proud.

THE TELEPHONE ON RAILROADS.

IF THE signs of the times are to be taken as an indication it will not be many years before the telephone will entirely supplant the telegraph in the big railroad systems of the country, as the agency employed in train dispatching. This is not an idle statement, made in a moment of ultra-enthusiasm over the future of the telephone, but an assertion founded on cold facts, for step by step the great railroad systems of the United States are coming more and more to realize the inestimable value of the telephone in the handling of trains, moving of traffic, etc., and several of the leading roads already have installed and are successfully operating private telephone systems, constructed at a cost of hundreds of thousands of dollars. The Pennsylvania, Illinois Central, Lake Shore and New York Central roads are cited as examples. The Erie road will erect a system from New York to Cleveland, and it is also reported that the Burlington road is planning to substitute the telephone for the telegraph in dispatching and operating both passenger and freight trains. The management of this latter road was influenced in favor of the telephone, it is said, after comprehensive trials had been made on various portions of the company's lines for several years. The management stated that these trials had proven eminently satisfactory and that under the system in vogue there had not been recorded a single instance of mistake in the transmission and receipt of train orders. This record is one that has rarely been equaled by the telegraph and in the opinion of Burlington officials it removes the main objection hitherto made to the use of the telephone for train operation—liability to mistake in transmission of orders.

The further advantages of the telephone, as stated by the management of the Burlington road, and as likewise affirmed by the officials of other roads employing the telephone, are that it greatly enlarges the choice of men for the operating service. Thousands of good men can talk intelligently over the telephone where comparatively few can use the Morse code; it lessens the possibility of a strike, and in the event of a strike makes it much easier to fill the positions.

Following the determination of the management of the Burlington road comes the report that the telephone will take the place of the telegraph on the Gould railways west of the Mississippi. Each tower marking the beginning of a "block" will be equipped with a telephone, so that the tower men and dispatcher will be able to watch the movements of all passing trains.

The telegraph and telephone each, of course, has advantages which the other does not possess. A telegram when received becomes a matter of record, but a telephone message is a personal conversation which would be difficult to use in order to fix responsibility in case of accident. But the telephone gives a wider field for inquiry and report, with more facility of going into details, and this seems to be

the reason which makes its use preferable to that of the telegraph.

There are always two sides to a question, and it would be quite unusual if there were not some influential railroad men who opposed the use of the telephone as a medium for train dispatching. Here is what a Lake Shore official says on the subject:

"Train dispatching by telephone has been tried on our road, but it is not entirely satisfactory. One vital objection to a telephone system to be used in the transmission of train orders is that the man to whom the orders are given may misunderstand. The transmitter does not know what the receiver is putting down. He may be writing sentences placing an opposite construction upon the message sent him. In such a case the bother of explanation over the telephone with the ever present fear of a misunderstanding would make the system dangerously inadequate. On our road the telephone plan will be used to a large extent in the matter of transmitting orders for the making up of freight trains along the system, but the test as to the movement of passenger trains seems not to have been of the most satisfactory nature. For that reason the substitution of the long-distance telephone service for the telegraph ticker as a train dispatching agency will not be adopted—at least not in the immediate future."

On the other hand, as favoring the telephone, a prominent railroad man of the northwest said to a representative of TELEPHONY:

"The possibilities of the telephone are only half understood by railroad men. The entire work of operating trains can be wonderfully simplified by its use. Work can be done in two minutes that now requires thirty minutes by telegraph, to say nothing of the hard work involved. There is no reason in the world why the telephone should not displace the telegraph for railroad work. The same care can be exercised in sending and repeating train orders, and in supplying all sorts of quick information which must go over the wire.

"In the fall of the year, when the lines are burdened to a point where operators and train dispatchers are driven crazy with work, the telephones will prove a wonderful help and will contribute to safe operation, rather than remove one of its safeguards.

"An immense sum of money can be saved by the use of telephones, and more efficient service can be secured by their adoption. Take, for example, the vast number of small stations where a night and day telegrapher must be maintained. There may be little work, but we are compelled to keep two operators there. Now a resident of the locality of good ability and established character can look after the station just as well as a telegraph operator. He may be a man of exceptional merit, and can aid us in securing business at comparative points. The operator may be a total stranger, whose only excuse for getting the job is that he can work a telegraph instrument and he is therefore absolutely indispensable at present.

"Hundreds of bulky messages that now encumber the wires could just as well be sent by mail, and assuredly they could be sent by telephone. I do not wish to be understood as disparaging the work of train dispatchers and operators, but am merely pointing out the possibilities of the telephonic system. I am an old telegrapher myself, but I am convinced that the days of the operator on railroads are numbered."

Since the extensive experiments recently conducted by the Great Northern railroad in utilizing telephones in train dispatching other Northwestern roads have become impressed with the practical advantages of the new system. The great lessening in the cost of the service, viewed in its best development, appeals strongly to railroad managers, and even the most conservative of them now admit that the telephone is destined eventually to supersede the telegraph in all railroad work.

TELEPHONE SERMONS.

TRUST the Yankee to find a way. The latest novelty is a church telephone from pulpit to pew, so that the hard of hearing may not miss any of the service. This unusual arrangement is to be tried in the leading church of a New York town, and press dispatches tell us in all solemnity that the church officials have really sanctioned the move. A specially constructed transmitter will be placed near the preacher's head, so that his remarks will be caught by it; small receivers that can be concealed in the hand will be placed in the pews. Sleeping in church will now be out of the question, or at least the excuse of not being able to hear the sermon will need a substitute. And now that an arrangement has been found whereby all can be made to hear the preacher it decidedly increases the latter's responsibility; there must be interesting sermons.

THE SITUATION IN CALIFORNIA.

ACCORDING to all reports the telephone situation in California must be nearly as glorious as the climate. Telephones in the Golden State don't exactly grow on trees, but the conditions out there are so favorable for installing and operating exchanges that the state is rapidly becoming a network of Independent telephone lines. This paper recently received a letter from one of its California subscribers—a San Jose woman, by the way—which touches upon the subject of telephony in her home state in the most glowing manner, her communication taking on the nature of a telephonic rhapsody. She says:

"A few days ago my husband brought home an eastern paper, which had in it an article on 'The Telephone in Domestic Economy' and which went on to praise the man who installed a telephone in his home for the use of his wife. I read the article to my husband, and he, of course, patted himself on the back because he had been thoughtful enough to have a telephone installed when we first started to keep house. I replied that the article was timely and applicable in the effete east, where women could not find as good raw material to convert into nice husbands as is possible out here on the Pacific coast, but for Californians it was as superfluous as would be an article advising husbands to purchase stockings for their wives. For practically every home in San Jose has a telephone!

"Recently our club looked into this telephone question, and we found that with a population of 22,532 in San Jose, there were 4,275 subscribers to the local service, or nineteen telephones to each 100 of population. And we found that this is not an exceptional telephone town. For there are several other places along the coast, both in Oregon and in Washington, as well as in California, that make a better showing from the telephone point of view. For instance, we found that Marshfield has twenty-one telephones, Bakersfield twenty, Visalia, San Mateo, Marysville and Pasadena each have seventeen, Palo Alto and Modesta each sixteen and Riverside and Salinas each fifteen telephones, to every 100 of population. Then up at Colfax there are twenty-five, and at Hood River twenty-four telephones per 100 inhabitants. While little Ferndale, with a population of 875, has 327 telephones in service, or 37 telephones to each 100 inhabitants!

"Why, out here on the coast when a man arrives at the conclusion that what goes with a plain gold ring and a marriage license is essential to his future happiness, he orders a telephone installed in his future home the same day that he selects the cooking range and the bedding. And if the girls in the east will take the trouble to train their lovers along the right lines, they, too, will find that when the

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honeymoon is over the husband will be careful to provide whatever will 'serve to exhilarate the wife into achievements that make life worth the living.'

"And ninety-nine out of every 100 Californians will tell you that no woman on earth can 'make life worth the living,' quite in the same degree as we can. And all the credit is not due to the telephone in the home, or to our glorious climate, but to the training our husbands received while they were our lovers."

This bears out what we have all along said about the necessity of the telephone in the home, as an important contributory cause to the general happiness of the household, and we heartily agree with every word that our fair California subscriber has said in favor of the telephone as an adjunct to the home. We always knew those Californians were progressive, and now we are more than ever impressed with their wisdom and enterprise.

THE POINT OF VIEW.

WALTER C. KERR, a prominent electrical manufacturer, on finding himself placed in the somewhat awkward position of addressing a graduating class of engineering students, executed a performance which placed him at once in the rather lonely class of practical philosophers concerning industrial education. His address, which is entitled "The Point of View," sparkles with sound sense and apt phrasing. Some of them are aphorisms and epigrams which will live, and which fit the telephone business amazingly well. Here are a few of them:

"Many a man is surrounded by opportunities, but never sees one. There are traditions that Adam, William Tell and Sir Isaac Newton each had an affair with an apple, but with different results."

"It is the newer arts, such as ours, which have the larger and more plentiful possibilities."

"The main improvement that most things need is in the line of sufficiency. You can think this over for yourself and apply it where it fits."

"When you are getting what you go after, get it all. Avoid the mediocrity of compromise. Be thorough and stand for full competency in everything, from main essentials to details."

"Singleness of purpose is intuitive with the comparatively ignorant, and often absent in the highly trained. We are frequently surprised at the great competency of the ignorant contractor or foreman, upon whom judgment is often passed by saying he is a practical man and gets results."

TELEPHONE LINES REAL PROPERTY.

CONSIDERABLE surprise was expressed by Illinois telephone men recently by the publication in one of the Chicago papers of the statement that under an act of the last general assembly of Illinois the property of telephone companies in that state had been made real instead of personal. As a result a large number of inquiries have been made of TELEPHONY to learn the exact scope of the new law. The act was rushed through the legislature and very few knew anything about it. Many of the smaller Independent lines throughout the state did not know that they had been afforded relief through this measure and a number of chattel mortgages have been executed under the theory that the property of telephone companies was still personal instead of real and that they might execute real estate mortgages.

The Illinois statute governing chattel mortgages, Chapter 95, Starr & Curtis, provides that mortgages of personal property shall be admitted to record and shall be good and valid for the term of two years only, but with the provision that if the mortgagor and mortgagee shall within thirty days next preceding the expiration of such two years file for record in the office of the recorder an affidavit setting forth the interest which the mortgagee has by virtue of the mortgage and the amount due and unpaid, then the lien of such mortgage shall be extended for a second two years. Under this section it is very doubtful if any mortgage of personal property can be extended beyond the second term of two years; in other words, it is only good, at the best, for four years.

Telephone properties are personal property. To carry out the work of the Independent companies in the field it is necessary to borrow money for extensions and betterments, and this money must be secured by mortgages upon the property. For the purpose of making this possible, section five of Senate Bill 240 was drawn, and it simply provides that any mortgage or deed of trust upon telephone property shall be executed and acknowledged as a real estate mortgage, and that when recorded it shall be a valid lien in the same nature as a mortgage upon real property.

This same act has been passed in other states where the necessity for such security of telephone bonds was known. Many of the Independent companies have already executed mortgages and have attempted to secure money thereunder by the sale of bonds secured thereby, and this weakness of the Illinois statute has been brought to light by the people who proposed to purchase the bonds; therefore, the section is intended to validate such mortgages and the bonds issued thereunder.

EDITORIAL ETCHINGS.

The better organization crusade is gaining ground every day.

The telephone works on an eight-hour schedule—three times a day.

An Independent toll line from coast to coast may yet become a reality.

The telephone is the most potential instance in the march of modern progress.

Prompt service at central, backed up by pleasant, accommodating operators, is a sure dividend winner.

The perfectly operated exchange will never be an accomplished fact until a virus is discovered that will kill the matrimonial microbe.

The most appropriate, most profitable, and altogether the finest Christmas present any town or city can make itself is an Independent telephone franchise.

Wireless telephony is an uncertain quantity as yet, but so also have been other great discoveries and inventions—the first speaking telephone, for instance.

Independent securities, in the parlance, are as "good as the wheat." The investing public has come to recognize this fact, and the bonds of Independent companies are now in steady demand.

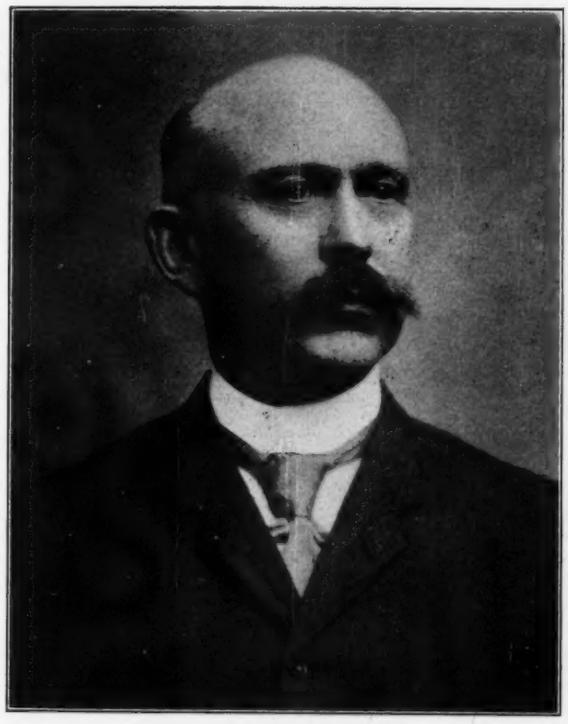
The movement for better organization is rapidly taking definite form in those states where the work of the Independents has become a potent factor and its purpose and importance are understood and appreciated.

By the time the national association is a year older it will have risen to its true and merited importance in the Independent field; and with all the other state organizations working in harmony with it, its influence will be as mighty as its territorial scope.

An Aggressive Eastern Company

THE State Line Telephone Company of New York city, with offices at 150 Broadway, is recognized as one of the strongest, most successful and most ably managed Independent telephone companies in the United States. Its growth from the start has been phenomenal, due to the unerring direction of its affairs by the shrewd business men back of it, until to-day it is a tower of strength in the Independent field of the east, and is not alone doing great work in developing its own territory, but by its aggressiveness, and because of the unfailing success of its numerous undertakings, it has come to be looked upon as a guide and inspiration—a guide to those about to embark upon Independent telephone enterprises and an inspiration to those already engaged in the laudable work of disseminating Independent doctrine in its most practical sense.

The State Line Company was organized in July, 1903, under the transportation corporations law of the state of New York, for the purpose of building, owning, and operating telephone lines. The charter provides for the issue of $500,000 of preferred stock, entitled to draw eight per cent cumulative annual dividends and to share in all profits above eight per cent, and $500,000 of common stock. All stock has cumulative voting power or "minority representation," and is issued only when fully paid. The charter of the company is very broad; it possesses condemnation rights, entitles the company to do not only a telephone business, but to operate lines of telegraph and telautograph, to furnish messenger service, and to engage in any other business auxiliary to its main purpose. It has ample provisions for the building of a system of trunk lines throughout the state of New York, New England and elsewhere, it being the purpose of the company to ultimately build and operate an extensive system of long-distance telephone lines for the purpose of furnishing telephonic connection for the thousands of Independent telephone systems now in operation, furnishing the same connection with New York city.



MANAGER D. A. REYNOLDS.

Soon after the organization of the company, a contract was entered into between the State Line Telephone Company and the Atlantic Telephone Company, in which the Atlantic Telephone Company agree to construct an Independent telephone system in the city of New York, and furnish exclusive connection to the State Line Telephone Company for a period of ten years. In pursuance of this contract, the Atlantic Telephone Company has secured the necessary franchises for building its system in New York city, and has made a partial canvass of the city, resulting in orders for over 75,000 telephones. Its backers are now engaged in financing this great enterprise on a basis of $24,000,000. In addition to this contract, the State Line Telephone Company has thus far provided for an interchange of business with the Colonial Telephone Company of Newburgh, the Dutchess County Telephone Company of Poughkeepsie, the Columbia County Telephone Company of Hudson, and the Sharon Telephone Company of Sharon, Connecticut. These companies in turn already have connection with the Chester Telephone Company of Chester, the Citizens' Standard Telephone Company of Kingston, the Farmers' Union Telephone Company of Sussex, New Jersey, the Highland Telephone Company of Highland Mills, the Orange County Telephone Company of Middletown, the Port Jervis Telephone Company of Port Jervis, the West Shore Home Telephone Company of Catskill, the Warwick Valley Telephone Company of Warwick, and the Sussex Telephone Company of Newtown, New Jersey, all of which will be tributary to the lines of the State Line Telephone Company.

These several systems embrace between 6,000 and 7,000 telephones, all of which are tributary to the lines already constructed by the State Line Telephone Company, its lines forming the connecting link in Dutchess county, extending south across Putnam county into Westchester county, and reaching the following cities and villages:

Allaban, Amenia, Amenia Station, Andover Junction, Arkville, Arlington, Arthursburg, Attlebury, Austerlitz, Bangall, Beekman, Bemmerville, Bethel, Big Indian, Billings, Binnewater, Blairstown, Bloomingburg, Blooming Grove, Blue Store, Boiceville, Branchville, Branchville, New Jersey, Broadheads Bridge, Bullshead, Bull-'ville, Canaan, Canaan Center, Central Valley, Chatham, Chatham Center, Chester, Chichester, Churchtown, Circleville, Claverack, Clermont, Clinton Corners, Clintondale, Clove, New Jersey, Coldenham, Colebrook, Colesbrook, Coleman Station, Columbia, Corkertown, Cornwall, Cornwall-on-Hudson, Cottekill, Craryville, Crystal Run, Dover Plains, East Chatham, Elizaville, Fair Oaks, Farmers' Union, Flat Brook, Franklin Furnace, Freedom Plains, Ghent, Glasco, Glencoe Mills, Glenwood, New Jersey, Goshen, Grand Hotel Station, Greendale, Green Haven, Greenville, New York, Greenville Turnpike, Greycourt, Hainesburg, Hainesville, Halcottville, Hamburg, Hibernia, High Falls, Highland, Highland Mills, High View, Hillsdale, Hollowville, Houses, Humphreyville, Hunter, Huntsville, Iliffs Lake, Jewett Center, Johnsons, New York, Kelleys Corners, Kingston, Kripplebush, Lagrangeville, Lake Charlotte, Lakeville, Layton, Leedsville, Lewisburg, Lexington, Libertyville, Linlithgo, Linlithgo Station, Little Britain, McAffee, McIntyre, Malden Bridge, Manorton, Martindale

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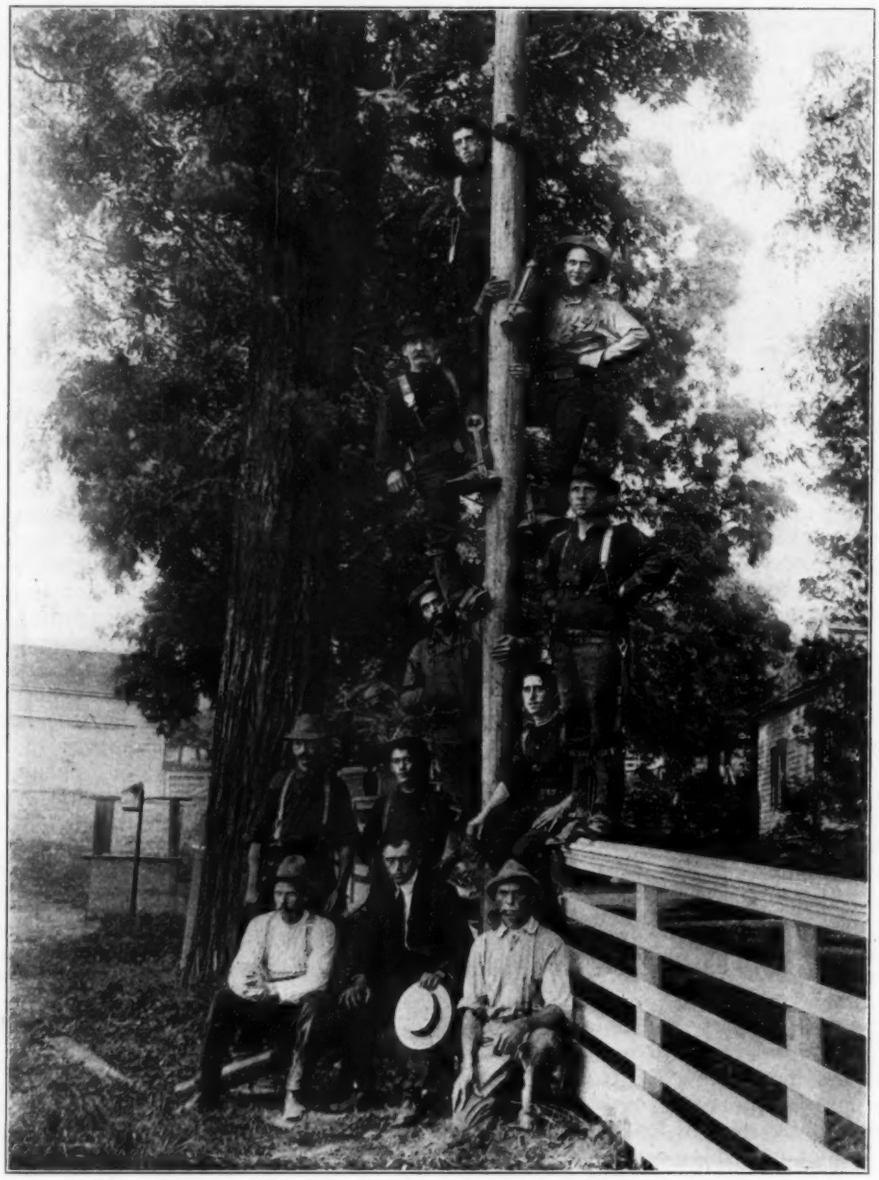
Depot, Manchester Bridge, Margaretville, Mechanictown, Mellonville, Middlehope, Middletown, Millerton, Milo, Monroe, Moodna, Mountainville, Mount Johnson, Mount Salem, Mulford Station, Netherwood, Nevis, New Britain, Newburgh, New Concord New Hamburgh, New Platz, New Windsor, Newton, North Chatham, Northeast Corners, Old Chatham, Olive Bridge, Overlook, Owens, New Jersey, Oxford Depot, Papakating, New Jersey, Peters Valley, Philipsburg, Philmont, Phoenicia, Pine Bush, Pine Hill, Pine Island, Port Ewen, Port Jervis, Poughkeepsie, Poughquag, Pulver Corners, Pulver's Station, Quarryville, Queency, Red Mills, Red Rock, Ridgebury, Rifton, Rosendale, Salisbury, Salisbury Mills, Salt Point, Saugerties, Schultzville, Sharon, Sharon Station, Sharon Valley, Shandakan, Shekomeko, Shokan, Slate Hill, South Amenia, Sparta, Spencers Corners, Spencertown, Standfordville, State Line, Stilwater, Stissing, Stissing Junction, Stone Ridge, Sussex, New Jersey, Swartzwood, Sylvan Lake, The Corner, Thompson Ridge, Turners, Tuttle's Corner, Unionville, Upper Red Hook, Vail, Vail's Gate, Van Keuren's Station, Vernon, Walkers Mills, Walnut, Wantage, New Jersey, Wappinger Falls, Washingtonville, Warwick Valley, Wassaic, West Hurley, Westkill, West Pawling, West Shokan, West Taghkanic, Westtown, Winchell, Woodbury Falls, Woodstock, Wykerstown, New Jersey.



WIRE MEN—CONSTRUCTION DEPARTMENT.

The purpose of the State Line Telephone Company, besides entering new territory as yet without telephone service, is to practically parallel the Bell long-distance lines, much as the Postal Telegraph did the Western Union, weaving together the numerous Independent telephone systems and connecting the same with the New York city system, affording metropolitan connections. The value of such a system will be apparent when it is remembered that there are at present over 5,000 successful Independent telephone companies in the United States with about 4,000 additional exchanges operated by private individuals and communities, embracing between 3,500,000 and 4,000,000 telephones, or about two and one-half times the number included in the present Bell system.

This enormous showing represents the growth of practically eight years, since the expiration of the Bell basic patents, and is indicative of the field this company will ultimately occupy. While present development will guarantee such a system fully two and one-half times the patronage enjoyed by the Bell long-distance company, the natural growth of the Independent telephone systems throughout the country will ultimately swell the business to at least twice the present earning power. In a consideration of this statement, it should be remembered that this phenomenal growth of the Independent systems has been without the aid of a trunk line system, or long-distance connection, and that the facilities which the State Line company will be able to afford the Independent companies will greatly extend their field of operation and enable them to meet every requirement of the communities in which they operate.

During the time necessary for the Atlantic Telephone Company to arrange for its New York city system, the State Line Telephone Company is engaged in practically surrounding the city for a distance of 100 miles with a series of county systems, in which every city and village is provided with telephonic connection, the same being made tributary to its main lines. These county systems are made cooperative to a large extent by the fostering of farmers' lines, the company making a universal ten-cent rate for any message within the county system. Right of way is secured by co-operation with farmers, in which they are furnished telephone service with their nearest village at the nominal charge of $2 per month, where the company furnishes the instrument, or at $1 per month where the farmer constructs his own line. Each village is provided with a switchboard of sufficient capacity to accommodate all who may desire telephone service, while the rate of $1 per month for switchboard service is so low that nearly every farmer, or person of any importance in the commun-

ity, is quite sure to avail himself of the opportunity. This practically amounts to universal installation in which all are benefited, the right of way being universally contributed by the farmers for the benefit they may derive from the system.

In addition to this co-operation, the company, in appointing an agent for each village, requires a pledge of patronage, covering practically the cost of the line, the pledgers receiving coupon books to the amount of their pledge, for which they pay at the rate of five or ten cents per message, the entire amount pledged becoming due at the time the lines are built to their respective villages. As an indication of the hearty reception of this plan of co-operation, it may be stated that the pledges received in Dutchess county amount to $17,000, in Putnam county to over $5,000, while only a partial canvass of Westchester county has resulted in pledges already of over $25,000. When this canvass shall have been completed in Westchester county, the company anticipates advance business to the amount of fully $50,000, which ought nearly to reimburse the company for the entire cost of construction of its system in that county.

Under this system of co-operation, the county lines of the company are virtually built from the proceeds of the pledges, while the earnings of the switchboards and telephones installed along the route make the system extremely profitable. These lines will practically weave together every city and village within a hundred-mile radius of New York, and will prove most prolific when the company shall be able to afford metropolitan connection. The earnings of the lines already built and in process of construction more than guarantee dividends on the preferred stock, with a substantial surplus toward dividends on the common stock, and extra dividends on the preferred stock, as the preferred stock shares in all surplus profits above eight per cent. The collection of pledges has already begun, the money being turned into the treasury for dividend purposes, thus insuring payment in advance for sufficient business to practically pay the entire cost of the county systems if it were so applied.

CONSTRUCTION FORCE—DUTCHESS COUNTY SYSTEM.

The progress of the construction work thus far has been most satisfactory. Though delayed by a backward spring, the company has already built more than 700 miles of line the past summer, and has material on the ground for fully as much more. It has arranged to complete its systems in Dutchess, Putnam and Westchester counties this season, and will devote the winter months to constructing exchanges in such territory, wherever the same may be desired. Its right of way is now about 100 miles in advance of construction, and it is gratifying to note that *not one dollar has been required in the payment of such right.* Fully a thousand farmers along this right of way have availed themselves of the offer of the company, which alone guarantees a substantial income upon the cost of the lines.

Another asset of considerable proportions is found in "stub" or small branch lines, built to, and included in the system, which the people, living off the general route of the State Line, being anxious for telephone connection with that company's lines, equip and donate to the company. These people contribute right-of-way, poles, dig the holes and erect the poles ready for the wire, the company merely supplying the wire and insulation. These lines range in value from a few dollars to several hundred dollars each, in one instance employing about fifteen miles of wire and a number of telephones, giving the company a very handsome revenue for both local and long-distance service on practically no investment.

With the dividends assured from the earnings of its county systems, the company has already taken steps to provide itself with funds for its larger field of operation. Realizing that the construction of the New York city system will require immediate construction of its trunk lines, the stock-

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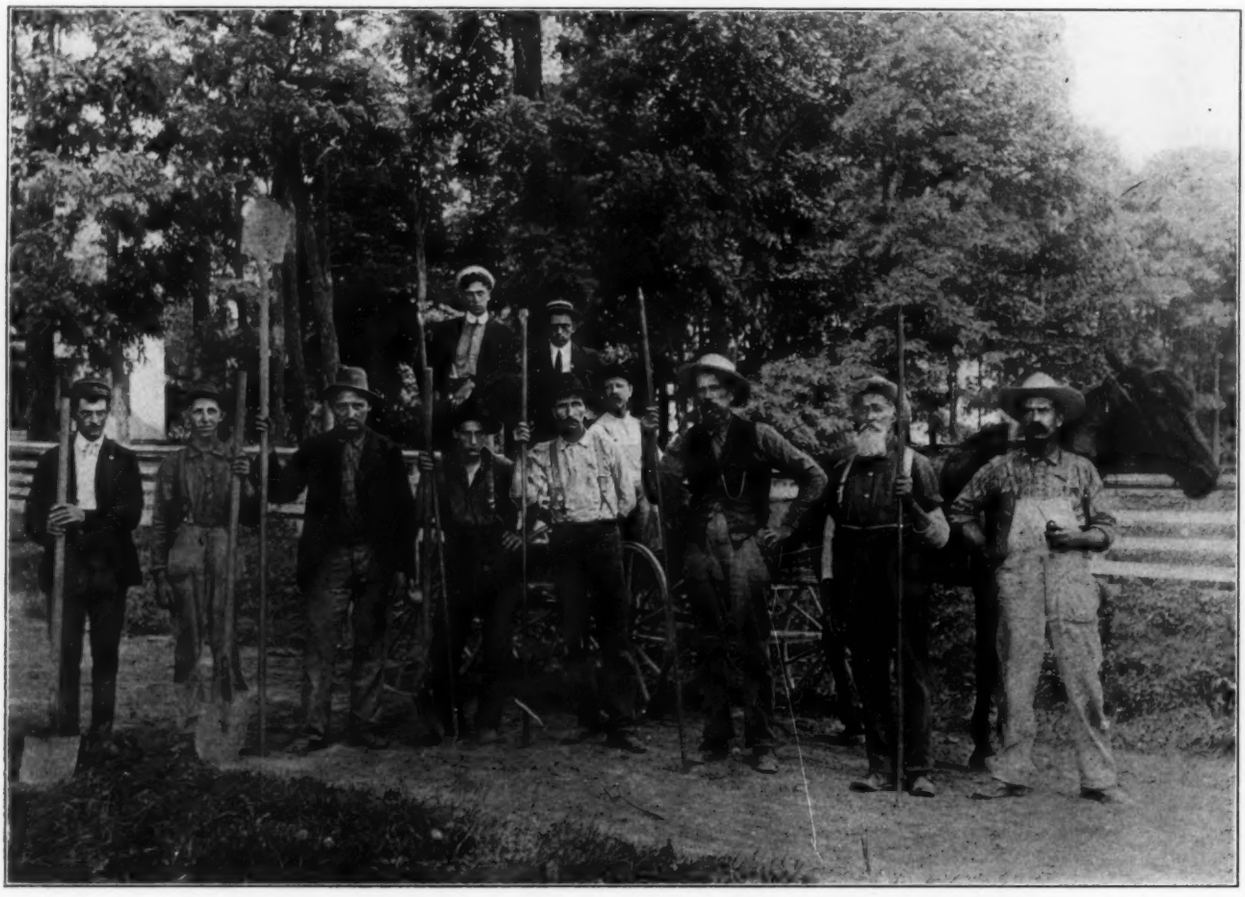
holders recently authorized an increase of the capital of the company from $1,000,000 to $10,000,000, such stock to be issued with minority representation and the other advantages provided in its original charter, stockholders of record being given first rights in any new allotment. This authorized increase will become effective as soon as the balance of the present allotment is subscribed, the proceeds to be employed in the construction of its trunk lines and in other additions to its plant, thus insuring a larger proportionate earning power.

In the disposition of its securities, the company has consistently declined the service of underwriters and fiscal agents, preferring to give its stockholders all the benefits of the common stock bonus, and other rights usually reserved to underwriters, thus securing to the actual investor the largest possible earning upon his investment. How large these earnings will be may be judged from the past earnings of the licensee Bell company occupying this field, which, without the co-operation of the people along its line, has been able to pay seven per cent dividends on a stock capital inflated to ten times the cost of its lines.

In Dutchess county alone, the State Line Telephone Company reaches forty-two villages not reached by the licensee Bell company, which not only shows the thoroughness of the work and the advantages it will have over its less active rival, but is a fair illustration of the difference between a policy of co-operation in which the whole community is tributary to its system, and the old, monopolistic policy of a limited field and excessive rates. If the old, antiquated system now in use can earn 70 per cent on the actual cost of the system without the active co-operation of the public, it is safe to predict a much larger earning from a modern system in which the entire community is interested.

The State Line company is prepared to spend $200,000 in the construction of a modern telephone system in Yonkers, which will include an extensive subway system, under control of the city.

Recently the people of Yonkers became tired of paying twice as much for a telephone message as for a street car ride and invited the company to apply for a franchise in that city. Immediately the New York Telephone Company, which operates in Yonkers, cut its rates to five cents a message, hoping thereby to head off its aggressive rival and prevent competition. These tactics are sure to prove futile, as the State Line company proposes to establish a rate as low as two cents a message. The company also proposes to make Yonkers its southern terminal until it can secure New York city connection, which will give Yonkers the benefit of a large rural trade, as nearly all the small villages and thousands of farmers in nine counties will be tributary to these lines. It is estimated that the Yonkers system will employ fully 5,000 telephones, charging practically about one-half the amount of the Bell company for service.



GROUND MEN—CONSTRUCTION DEPARTMENT.

The directors of the company are all conservative business men of integrity, ability and good judgment, thoroughly competent and experienced, who may be relied upon to safeguard the interests of stockholders and bring the system to the highest state of efficiency. Its president, E. M. Millard, has other large Independent telephone interests, as well as being heavily interested in the shipping industry of New York harbor. Its secretary and treasurer, J. Owen Huchberger, has long been identified with the substantial business interests of the city. Exceptionally conservative and conscientious, he is regarded with much favor in financial circles, where he has many valuable connections. His characteristics and qualifications eminently fit him to be entrusted with the handling of large corporate funds.

D. A. Reynolds, vice-president and general manager of

the company, is a pioneer in the Independent telephone movement. His first system at Lansing, Michigan, now has over 1,800 telephones in use, where the Bell company had but 256 before competition, while another of his enterprises at Jackson, Michigan, has over 2,300 telephones, where the Bell has 492, and is yet growing at the rate of sixty new telephones a month. It is no flattery to say that the unqualified success of the State Line company is, in a large measure, due to the careful planning, excellent judgment and rare executive ability of Mr. Reynolds.

One strong element in the management of the company is the allotment of a few shares of its preferred, eight per cent stock, to each village through which its lines may run, each man of prominence being offered from one to five shares. These men constitute a "local committee," whose judgment is consulted on all matters affecting the company's interest in that locality, and serves to create a local pride and patronage of great value. No "fiscal agents" or "underwriting syndicates" have been employed, so that each stockholder receives the full earning power of his investment.

Another characteristic of the management is the insertion of the following clause in every contract made with its connecting companies: "It is also mutually agreed that neither of the parties to this agreement shall sell, assign, transfer, lease, or in any manner dispose of its property or franchises to the American Bell Telephone Company, its lessees or assigns, nor any person, firm or corporation, antagonistic to the parties of this contract, or either of them, or enter into any contract or undertaking, that shall in any manner curtail, impair or interfere with the provisions herein contained for a period of ten years, without the written consent of the other party hereto."

The company numbers among its stockholders some of the most conservative investors in the metropolis, including merchants, manufacturers, capitalists, bank directors, presidents of savings banks, farmers, mechanics, ministers, wage-earners, and not a few women have taken advantage of its popular subscription to secure an investment in a substantial public service company devoid of "water" and safeguarded by contracts and franchises.

In holding its stock for popular subscription, the board of directors plan to so distribute it in a manner that will preclude the possibility of the control falling into the hands of any individual or syndicate of capitalists in any manner identified with Bell interests. It has also adopted the policy of making all contracts for an interchange of business with existing Independent telephone companies for a period of ten years, with a similar guarantee to the people along its lines who may purchase their own telephones or construct lines to connect with its system. All franchises are accepted on condition that the company remains Independent, and every other safeguard thrown about it that will tend to make its absorption impossible.

POLE MEN—CONSTRUCTION DEPARTMENT.

This principle of absolute Independence will be more firmly established at the time of increasing the capital of the company, by the increase of its board of directors from seven to fifteen, each director, as far as possible, representing not only his own investment, but that of his business associates who may have confidence in his integrity and business judgment. With such safeguards, coupled with economical and experienced management, occupying one of the richest telephone fields in the world, and enjoying special advantages in the form of exclusive traffic arrangements the company feels that it can safely offer its stock for popular subscription with the utmost confidence of it proving one of the most remunerative investments ever offered to the public.

INTERSTATE CONVENTION.

The annual convention of the Interstate Telephone Association will be held in Chicago, December 13, 14 and 15.

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Long Distance Submarine Telephone Cables

F. BREISIG

THE submarine telephone cable from Fehmarn to Lolland is a connecting link in the Berlin-Copenhagen telephone line. It has a length of 12 statute miles, and was ordered conjointly by the German and Danish telegraph authorities. Subsequently the cables Greetsiel-Borkum (18.3 miles) and Cuxhaven-Heligoland (45 miles) were put down. These cables were made and laid by Messrs. Felten and Guillaume.

The damping per kilometre of cable is a function of the expression $e\sqrt{(a+imc)(w+iml)}s$, wherein a = leakance, c = capacity, w = resistance, l = inductance per kilometre, m = frequency in 2π seconds and s = length of line in kilometres. This expression is now generally written in the form $e^{(\alpha i+\beta)s}$, wherein $e^{\beta s}$ denotes a constant and $e^{\alpha i s}$ a phase difference. The latter depends on the wave-length, and is important in connection with the theory of lines on the Pupin system. In the case under discussion, however, a need not be further discussed. If we assume—as is customary, especially when discussing cables—that the leakance is very small so as to be practically negligible—i. e., that the insulation resistance is very large, we get by simple transformation: $\beta^2 = \frac{mc}{2}(\sqrt{m^2l^2+w^2} - ml)$.

The value of β is easily determined by means of this equation, and, since the limits of $e^{\beta s}$ for satisfactory telephonic speaking are known for other lines, it is possible either to examine an existing line as to its efficiency with regard to communication or to determine the necessary value of β for a new line of given length.

Pupin has termed β the "damping constant." If the self-induction is very large, then the damping is practically the same for any frequency, and the speech transmitted over such lines will be clear but weak. If, on the other hand, the self-induction of the cable be zero, then the waves of high

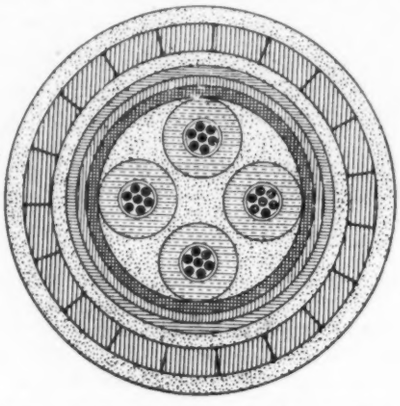

FIG. 1—FEHMARN-LOLLAND CABLE.

frequency will be much weakened and telephonic communications will sound loud but dull and toneless.

From Fig. 1, representing a section of the Fehmarn-Lolland cable, it will be seen that four cores have been used, each consisting of seven copper strands, 1.35 mm. in diameter. To increase the inductance, each of the four conductors is wound with a bare iron wire, having a diameter of 0.3 mm., and then insulated by several layers of paper tape, the diameter over the insulation being 11 mm. The four cores are then grouped around a jute core, the whole being subsequently wound with paper and tape. This unfinished cable

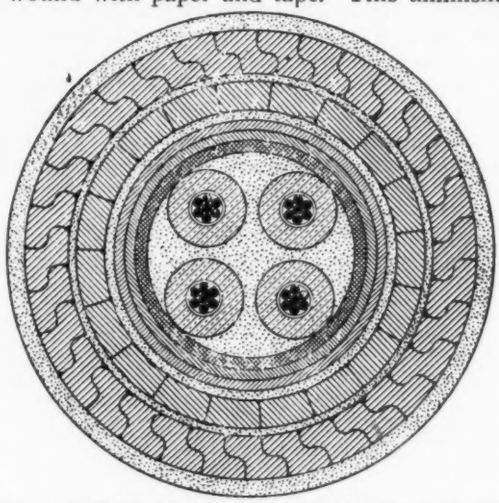

FIG. 2—FEHMARN-LOLLAND CABLE—SHORE END.

is now 32 mm. in diameter. It is then impregnated and covered with two lead sheathings (each about 1.5 mm. thick), the lead containing 3 per cent zinc. Upon this there are two layers of bituminous paper and compound. The armoring consists of 19 galvanized iron wires of a trapezoidal section. On top of this there are two layers of compound. One shore end of the cable has for a length of 1.24 miles an additional protection in the form of an armoring of 32 iron wires of the form shown in Fig. 2. The final covering of this portion of the cable consists of two layers of compound. The outside diameter of the cable is 55 mm. and 69 mm. respectively, the corresponding weights per mile being 17 and 32 tons. There are no joints, the cable being made in one piece. Both before the cable was laid in January, 1903, and subsequently, various experiments were carried out, and they proved that telephonic communication could be carried on very satisfactorily. The two other submarine cables mentioned were laid in the same year.

If, instead of using an insulation of bituminous paper, dry paper, loosely applied, is used for this purpose, the cable would gain in capacity, and a given damping might be obtained with a lighter cable. For the new cables, therefore,

FIG. 3.
GREETSIEL-BORKUM CABLE.

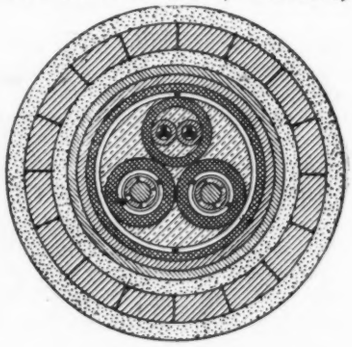

FIG. 4.
CUXHAVEN-HELIGOLAND CABLE.

air insulated lead-covered cables were decided upon. In order to prevent long lengths of the cable becoming moist in the case of damage to the sheathing, short lengths of about 5 ft. have been impregnated and are distributed over

[Abstract of a paper read before the Elektratechnischer Verein of Berlin.]

the cable at intervals of about one-third of a mile. Fig. 3 represents the section of the Greetsiel-Borkum cable, which is 18.35 miles long, and consists of one piece. The four conductors, consisting each of seven copper wires 0.8 mm. in diameter, are wound with a bare iron wire 0.3 mm. thick. Each core is then wound with several layers of paper tape until the diameter has increased to 3.7 mm. These four cores, together with four paper wormings (see Fig. 3) are then stranded around a twisted paper core of a section as indicated in the figure, the lay of the eight cores being opposite to that of the paper core. A spiral of paper cord follows, and over this a layer of paper and tape, the diameter being now 19 mm. After being dried, this cable core is provided with two lead sheathings (each 1.2 mm. thick), the lead containing 3 per cent of zinc. After this, there is a double layer of bituminous paper and one layer of bituminous tape (compound). The armoring consists of 23 iron wires of the shape shown in the drawing. Two layers of compound complete the insulation. The outside diameter of the cable is approximately 42 mm., the weight per mile being about 10.8 tons.

FIG. 5—CUXHAVEN-HELIGOLAND CABLE—SHORE END.

In considering the best construction for the cable to Heligoland (46.5 miles), it had to be borne in mind that it had to work satisfactorily with an overhead telephone line, 373 miles long, and constructed of bronze wire 4 mm. in diameter. The damping of the other cables would have been too large in this case, and a reduction of the damping to a value of about 0.007 had to be aimed at.

Fig. 4 shows the section of the cable decided upon. The cable contains four conductors, two of which are stranded and intended for telegraphic communication, the other pair, separated from one another, serving for telephonic purposes. The latter consist of a round copper wire (2.6 mm.), around which four wires are stranded. These four wires have an approximate rectangular cross-section with sides 2.4 mm. and 7 mm. long. A bare iron wire, 0.3 mm. in diameter, is found closely around the copper conductor. On this follows an open spiral of paper cord and a layer of paper tape, the diameter over this being 9.6 mm. Each telegraph wire, consisting of three strands of copper wire (0.89 mm. in diameter), is wound with paper to a diameter of 3.5 mm. These cores are then stranded and rounded off with paper, and the whole is wound with paper to a diameter of 9.6 mm. The two telephone cores and the telegraph core are then stranded together and the whole rounded off with paper, the diameter being about 21 mm. A distance of about 9.6 mm. separates the two telephone cores. An open spiral of paper cord follows, and then there is a layer of paper and tape, the outside diameter being about 24.5 mm. After drying, the cable is provided with two lead sheathings (each 1.4 mm. thick), the lead containing 3 per cent zinc. Then there are two layers of bituminous paper and tape. An armoring of 16 galvanized iron wires follows, the final protection consisting of two layers of compound. The outside diameter of the cable is 47 mm. the weight per mile being 13.5 tons. A length of about half-a-mile of the Heligoland end of the cable is provided with a second armoring (Fig. 5). Experiments on the finished cable have proved that telegraphic communication does not disturb telephonic conversation in the least. The transmission of speech is very good both over the cable alone as also over the cable and the overhead lines in connection with it. All different waves are sufficiently damped to an equal degree, and the speech transmitted sounds like on an overhead system.

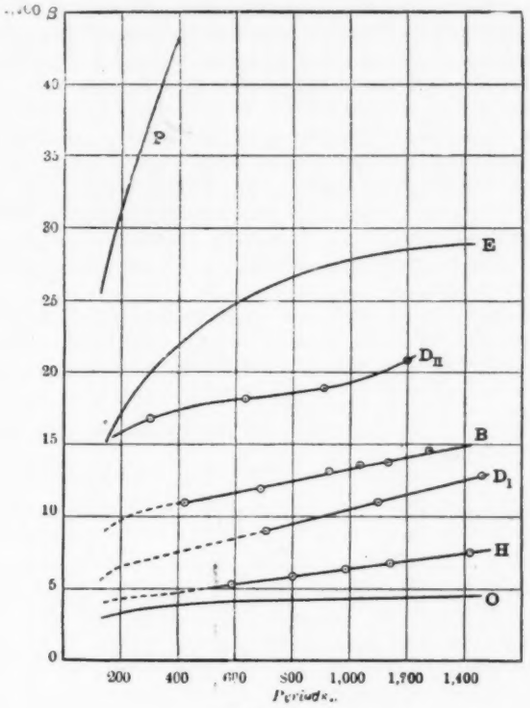

FIG. 6.

For comparison with these cables we will consider the cables between England and Belgium (54.6 miles) and Denmark and Sweden (3.3 miles). Both are gutta-percha cables. The English-Belgian cable has a conductor of 7 strands and weighing 160 lbs. per naut. Each conductor is insulated with gutta-percha to a diameter of 10 mm., this insulating material weighing 300 lbs. per naut. Four such cores are stranded and armored together. The Danish-Swedish (Elsinore-Helsingborg) cable has one conductor consisting of seven strands of a diameter of 0.8 mm. each. This conductor is wound with an iron wire (0.2 mm. in diameter) and then insulated with gutta-percha to a diameter of 8.2 mm. The electric properties of these cables (calculated for one branch of the symmetrically used double line) per kilometre and at a temperature of 15° C. are tabulated below;

Designation	Cable.	Resistance Ohms per km.	Capacity Mfd. per km.	Self-induction Henry per km.
D_I	Fehmarn-Lolland.....	1·71	0·1624	0·00250
B	Greetsiel-Borkum.....	4·86	0·0742	0·00399
H	Cuxhaven-Heligoland.	1·36	0·0914	0·00214
D_{II}	Elsinore-Helsingborg.	4·76	0·1745	0·00265
E	England-Belgium	3·83	0·144	0·00055

Fig. 6 represents the damping of these various cables as also of a cable of ordinary construction, P, containing a wire 1 mm. in diameter, and of an overhead line, O, consisting of a bronze wire 3 mm. in diameter. The damping of the three lead cables and of the Danish-Swedish cable are from tests of the complete cable, that of the English-Bel-

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gium cable being calculated from its dimensions. If it be assumed that satisfactory communication can be carried on over a cable, the damping exponent of which is 2.5 (calculated for a frequency of 1,000) then the distance over which satisfactory conversation can be carried out is, for the various cables, as follows:

	H	D_I	B	D_{II}	E
Distance in miles..	244	153	117	80	56

The advantages of the new construction are thus clearly shown. As regards a few details of the cables, the following remarks may be of interest:

The values for the capacity and self-induction of the cables as given in the table above apply to each branch of the double line. For the double line as a whole, the self-induction and the resistance are double and the capacity is half. The capacity of a cable with loose and dried insulation corresponds to a dielectric constant of 1.6, whereas that of an impregnated cable corresponds to a constant of 3.54. Since the Elsinore-Helsingborg cable has demonstrated that gutta-percha insulated cables with iron covering may be made and laid without difficulty, it would seem that lead-covered cables with impregnated insulation are no more to be seriously considered.

The capacity of both the impregnated cable and of the gutta-percha cable is smaller when measured with alternating current than when determined with continuous current, as is indicated by the following figures:

Cable	Capacity in microfarads, measured with	
	Continuous current	Alternating current
Fehmarn-Lolland	0·1624	0·1435
Elsinore-Helsingborg....	0·1745	0·1632

No law connecting the capacity with the frequency was discernible from the measurements made, the greatest discrepancies from the mean being 2 per cent. It is not possible to decide from the few measurements taken whether the decrease in capacity with alternating currents actually ameliorates the cable with regard to its damping effect or whether the advantage so gained is not counter-balanced by losses in the dielectric. The following table gives the self-inductions of the cables per kilometre length with and without iron:

Cable	Self-induction	
	With Iron	Without Iron
H	0·00214	0·00032
B	0·00389	0·00067
D_I	0·00250	0·00046
D_{II}	0·00265	0·00059

From these figures the mean permeability of the iron is calculated to be 101. By reason of the magnetization and eddy current losses, the self-induction of the cable decreases somewhat with increasing frequencies. The figures given refer to frequencies below 100 ~per second. In the following table the apparent resistances of three cables at various frequencies are given, the resistances obtained with continuous current being taken as unity:

Frequency.	H.	B.	D_I.
400	1·45	5·15	2·04
600	1·58	5·46	2·26
800	1·75	5·80	2·49
1,000	1·90	6·15	2·67
1,200	2·06	6·43	2·85
1,400	2·22	6·85	2·94

Since the increase in self-induction does not keep step with the increase of the diameter of the iron-covered conductor, the limits obtainable in practice are soon reached, and any further increase in the self-induction must be obtained by other means, such as those proposed by Pupin.

TELEPHONES ON A RAILROAD TRAIN.

Members of the Merchants' and Manufacturers' Association recently toured western Pennsylvania and Ohio in a special train composed of eight Pullmans. The Central District and Printing Telegraph Company made the innovation of placing a telephone in each car, so that members of the association could converse from car to car without leaving their seats. These telephones were also arranged to be connected to the long-distance lines at places where the train stopped for more than half an hour. This arrangement of telephone service proved to be very useful and has been highly complimented by the members of the association.

Arrangements were made in all of the towns where stops were to be made to have a direct wire run from the central exchange of the town to the siding where the train was to pull in. Before the train left Pittsburg an entire telephonic system was installed in the nine cars of the special. In the stateroom of the newspaper men's car a long-distance telephone was installed, the batteries being stored from view, and a neat little talking instrument set up on the wall of the stateroom. As soon as Steubenville, the first stop, was made, all that remained for the linemen to do was to attach the plugs from the train and the one on a pole near the station, about twenty-five yards of wire being used to make the connection. This wire was run under the tracks, the entire connections being made in a few moments. Then President Lloyd of the association called up Mayor Hays of Pittsburg and had quite a long chat with him. The telephone connection was instantly made at the office of Steubenville central, Steubenville called Pittsburg, and Pittsburg in turn gave the special train connection with the mayor's office.

After this experiment the chain of telephones in the various cars was connected up and it was made possible to talk from one end of the train to the other while the cars were bowling along at a speed of sixty miles an hour. The rumbling of the train did not seem to affect the hearing over the telephones in the least. It is thought that this experiment may be the forerunner of the equipment of all Pullman cars with telephones in this manner. The equipment was planned by S. P. Grace, chief engineer of the Central District Company.

TELEPHONE DEVELOPMENT IN LOS ANGELES.

The Home Telephone Company of Los Angeles has had a most remarkable growth. This company has probably developed the telephone business in its territory greater than the development has been in any other place. A conservative estimate of the population of Los Angeles is 153,000 people, and in this population the company has installed 20,000 telephones, or practically one telephone for each group of eight men, women and children. The company has also forged ahead in its private branch exchange business, now operating nearly 200 private branch exchanges, some having over 300 telephones each. The long-distance lines of southern California, which radiate from Los Angeles, are also developed to a point far beyond the expectations of the promoters of the Los Angeles company. There is hardly a hamlet in any direction from Los Angeles that has not ample long-distance facilities. Lines are now being projected which will eventually cover the whole of California, tapping every hamlet and village. The Los Angeles company has practically driven the Bell out of southern California.

DIGEST OF TELEPHONE LITERATURE

Conducted by Samuel G. McMeen.

A Great Independent System—Telephony, November.

An illustrated description of the system of the Inter-State Telephone Company operating in Illinois. A comprehensive map of the toll lines of this system accompanies the article. As this company operates 10,000 telephones and more than 1,000 miles of toll line, the details are interesting.

FINANCIAL AND ECONOMIC.

The Telephone in Kansas—DWIGHT.—*Telephone Magazine, November.*

A recital of some of the commercial and social changes which have resulted from an increase in telephone development.

Independent Telephone Securities—RAYMOND.—*Telephone Magazine, November.*

One of the reasons why investors have looked with favor on bonds issued by water works companies is the semi-municipal character of the enterprise due to the contract between the company and the city. Recent experiences in connection with the questions of franchise in large cities have opened the eyes of the public to the preliminary expenses necessary to secure public service privileges. A telephone company is no counterpart to this semi-municipal condition, its relations to the city, other than those of the permissions in its franchise, being limited to a small amount of telephone service used by the city, and often this is not paid for. By and large, the telephone business is the most successful in the United States to-day, and in every community growth is taking place. The best evidence of the satisfaction of the public with telephone investments is in the fact that there are 7,000 Independent companies serving more than 2,500,000 patrons, and representing an investment of not less than two hundred million dollars.

The Telephone in the Country—KERR.—*Telephone Magazine, November.*

The work of the farm can be lightened greatly by the use of the telephone. Nothing else that can be had for $1.50 a month will prove of as much service. The total labor saved in a county by the existence of rural lines is enormous. At certain seasons, particularly in fruit regions, constant touch with the market is necessary to enable the output to be disposed of in a satisfactory way. This is most notably true when there are markets in different directions from the farmer. In former days the fruit was taken to a market and had to be disposed of there, as another would not be found near by. To-day the farmer knows his market and his price before he leaves the farm. This saves money. Not long ago many a man hauled wheat to an elevator, and, finding the price too low, hauled it miles to another. To do such a thing now, with the telephone at hand, would be considered the height of folly. Perhaps, after all, the farmer and the city business man find the greatest use of the telephone in arranging appointments in advance, and if there were no other usefulness in the art, the total social and commercial benefit would be magnificent.

Home Telephone Company, Springfield, Missouri—Telephone Journal, November 19.

A description of the equipment, rates and development of the company mentioned, 1,900 Independent subscribers having been secured and put in operation in twenty months.

Accumulators in Telephone Service—GRADENWITZ.—*Telephone Magazine, October.*

The German telegraph department, as long ago as 1895, decided to conduct experiments in the use of storage batteries at the stations of subscribers. It is the conclusion of the department that the initial advantages of storage battery operation in this way are not sufficient to offset the disadvantages of caring for the scattered cells, and no further extension along these lines will be made.

EQUIPMENT.

Telephone Switchboards—MCMEEN.—*Telephony, November.*

An illustrated description of one of the standard types of common battery multiple switchboards used by the Bell company, and includes the broad principles of the line and cord circuits.

Winding Relays—WEMAN.—*Telephone Journal, October 29.*

It is often necessary to rewind a relay in order to adapt it for a different current and a different terminal potential. If the voltage for which the relay is wound and the voltage for which it should be wound are known the formulæ given in this article will enable the new resistance to be calculated from the old. Similar calculations are suggested for relative numbers of turns with different windings, as well as for calculations based upon a comparison of the cross sections of the wires of different windings.

A Handy Instrument Record—JUDSON—*Telephone Journal, October 29.*

Every instrument owned by the company should be recorded by number, and a card-index record is most satisfactory for that purpose. The number and name of the subscriber, with other important information concerning the installation, are entered upon this card, and by means of such an index, properly modified as changes take place, a continual inventory of scattered property is secured. Tags properly printed in readiness to be filled out for installations and removals are convenient, if of different colors, to indicate special features.

Alternating Current Relay—FOWLE.—*World and Engineer, November 19.*

Ringing currents for telephone purposes have a standard frequency of 1,000 cycles per minute, or, roughly, sixteen cycles per second. Relays of the ordinary type, adapted to respond to direct currents, will respond to currents from the source of such ringing energy, but in most cases cannot be depended upon to close a contact and hold it closed, but will break the local contact at the instant of reversal between half waves. This author has designed and here describes, illustrates, and analyzes the action of a relay particularly adapted to close its contact and hold it throughout the time of current. As the difficulty to be overcome lay nearly in the instantaneous break at the time of no current, he has wisely attempted to overcome this by eliminating any such absence of current. By providing a relay with two circuits, one containing inductance and no capacity, and the other containing inductance and capacity in series, the problem has been solved, because the phase of the current is so displaced in one of the windings as to cause attraction of the armature by one core or the other at any instant. The author does not claim absolute novelty, as Edison and Jones have worked along similar lines, but no one seems to have employed just such a device as this adapted to be used with periodic alternating currents. There are many phases of exchange and toll line working in which such a device would be of value.

The Telephone—TAYLOR.—*Sound Waves, November.*

A further installment of the serial which Mr. Taylor has been carrying on for some months. This portion treats of intercommunicating systems, and is illustrated with many drawings. The simplest form of intercommunication between a number of stations, is accomplished by placing all of the stations on one circuit, but this has the disadvantage of utilizing the entire line for one conversation at a time. A

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more useful method is to carry the line to each of the various stations, with a switch thereat in such a way that while part of the line is serving one conversation, another part may be utilized for communication between two other stations. The connection of the desired station with the selected part of the line, and the exclusion of the part not required, may be accomplished by means of switches having levers, or by means of jacks, plugs, and flexible cords. A wide variety of choices of these methods, and of details as to signal bells, etc., are covered by the scope of the article.

Automatic and Wireless Telephony—CARPENTER.—*Telephone Magazine, November.*

A report of an interview with Professor Goldsborough of the Louisiana Purchase Exposition, in which optimistic opinions with reference to both automatic switching machinery and the possibilities of wireless telephony are expressed.

Intercommunicating Telephones—ROUGE-ET-NOIR.—*Electrician, London, November 4.*

A description of installations of the type of private exchanges involving no switchboard, but in which any station may be called from any station. An advantage possessed by English and continental apparatus is that the terminals upon all the sets are marked with a standard code.

Private Branch Exchanges—O'BRIEN.—*Telephone Journal, November 19.*

The fourth article of a series, each article being by a different author. This writer treats of circuits and their operation, touching upon those working in connection with magneto, and those in connection with common battery offices. As common battery exchanges are becoming more and more general, it is the latter phase which is of chief present interest. The circuits illustrated involve the use of a repeating coil in each cord circuit, and a visual signal for each subscriber in a connection.

Subway Construction—CRAIG.—*Telephony, November.*

The fourth article of the series. Manholes or vaults form a very essential part of underground systems, and require to be designed with care to adapt them to local conditions. Width, depth and frequency vary as the conditions change. Concrete or brick construction may be chosen. The cheaper form is concrete, but it requires a standard mold, while brick manholes can be constructed more flexibly and may be modified to fit conditions not expected in advance. Brick manholes should have walls eight inches thick or more. Round manhole covers are preferable, because they can never fall through the hole into the vault and injure the cables. The principal manhole at the office shall be larger than any of the others, and when possible should communicate direct with the basement of the building. In distributing the conductors from the subway, the cables may be carried to distributing poles in the blocks or to terminals in the buildings to be supplied with service. Where a given building will not consume all the conductors of a cable, and where permission can be secured, the lines may pass from the cellar of one building into that of another. The article contains general instructions of a useful detailed character as to handling the men engaged on the laying of conduit material. The records which are to be kept are illustrated by forms. Specifications for the arrangement of the cables indicate the information necessary to have the cables furnished in proper lengths and placed in the proper ducts.

LINE AND LINE CONSTRUCTION.

Building a Cross-Country Line—*Finance, November 5.*

In this description the camp life of men engaged on long line construction is described in detail, as well as the engineering work which precedes the actual construction. The routine of work between the beginning and the end of building includes the work of trimmers, diggers, blasters, gainers, pole setters, fillers, wire stringers and bankers. The use of a pole derrick requiring four men, two horses and a boy saves $15 or $20 a day over the old method of setting poles by means of pikes. Interesting features of wire stringing and pulling conclude the article.

Special Construction Wagons—TYLER.—*Telephone Journal, November 19.*

In order to take satisfactory care of construction crews in the country, the Twin City Telephone Company of Minneapolis has provided sleeping cars and dining cars to be drawn by horses, and in a considerable experience covering the construction of over 600 miles of circuit, this method of caring for the men has been found very satisfactory.

Noisy Lines—KELSEY.—*Sound Waves, November.*

A most frequent complaint from medium-sized exchanges is that previously quiet grounded lines have been rendered practically useless by the installation of an electric light or power service. Whatever justice may lie in the contention that the later comer should have respected the conditions established by the earlier, the author does not advise litigation in the hope of curing the noises. The fundamental fault lies in the failure of the operating company to provide the best known circuits, these being lines of two wires each. Much value exists in consultation between telephone and electric power interests, particularly in the time before the selection of the heavy machinery for the latter service. Various types of generators differ among each other in the noises they produce in telephone lines. Careful planning of the construction of the power circuits may prevent an immense amount of later annoyance. A common return system, if intelligently constructed and properly maintained, will eliminate much noise, and at a less cost than a complete equipment of metallic circuits. A new condition has arisen in the adoption of high tension alternating current distribution of power for interurban railways. As the systems are largely three-phase, with three wires, external induction is practically zero so long as good insulation is maintained. The results which would ensue in case alternating currents were used direct on trolley wires at a considerable voltage cannot be foretold with accuracy, but it is anticipated they will be severe.

Treated Poles—MILLER.—*Sound Waves, November.*

Cedar poles from the northern states will soon cease to be available, this being especially true of the longer lengths. The demand for poles is increasing, and all kinds of wood are being taken for the purpose. Metal poles have been used in some degree in the past, but are objectionable as yet on account of their relatively high cost, and by some the fact that metal is a conductor is considered an objection. It has long been believed to be of value to saturate the wood of poles with some preservative. Where the treatment has been done at all thoroughly, it is broadly true that the life of such poles has been greater than was originally claimed. Such timber is proof against rotting and the attacks of all animal life. Several treatments may be applied to poles, varying in expense and in probable value, but the use of any improves the lasting qualities of the timber in a very great degree.

Transposition of Electric Conductors—FOWLE.—*Transactions American Institute Electrical Engineers.*

A paper presented to the Institute at the meeting on October 28. Alternating current transmission systems resolve themselves into two great classes: one for the transmission of power, and the other for the transmission of intelligence. The class first mentioned carries its energy at high pressure in large volume at low or moderate frequency, and in many other ways is distinguished markedly from the second class, represented by telephone systems. Two adjacent telephone circuits will mutually interfere unless the wires of at least one of the circuits are so treated with reference to their transposition spacing as to make their condition practically a neutralizing one with reference to the other circuit. How often to transpose the wires of a circuit, if built on poles, has been determined by experiment rather than by theory. The minimum transposition spacing in one standard system is one-quarter mile. It is necessary to devise different types of transposition systems

so arranged in advance that the transposition of each circuit, whether built at the time or to be built in the future, will be inductively immune from annoyance from other circuits. This applies to circuits on the same cross arm, and to circuits on others. The synthetical system of deriving types of differently transposed circuits is due to John A. Barrett. Arrangements of circuits sufficient to eliminate cross talk between them are not always efficient in preventing disturbances from power lines upon the same road. It is necessary, therefore, to apply special treatment to that portion of the disturbed or disturbing lines within the territory where there is mutual interference. The regular cross talk transpositions in such a territory may be canceled and a special set covering both power disturbance and cross talk may be applied. If, however, the disturbing power circuits can be transposed so as to produce a zero or minimum causing condition, the regular cross talk transpositions may be allowed to remain in the telephone circuits. The discussion of the paper contains valuable detail information.

Long-Distance Lines—HAUCK.—*Sound Waves, November.*

The most important requirement for long-distance lines is a high grade of construction and maintenance. It is more readily possible to secure good instruments than good long-distance lines, and a present necessity is the reaching of standard methods of construction among various companies. In local service the amount of the rate governs very largely in securing and satisfying customers; but on the occasional necessity of talking over long distances, the patron is usually willing to pay a very good price for good service. The most equitable system of proportioning earnings among the various owners of a combined system, is something based on a railway-traffic or bank-clearing-house analogy. Such a system is now in use in Wisconsin.

Bridge Crossings—MCMANN.—*Telephone Journal, November 12.*

In every construction of outdoor telephone lines particular and sometimes awkward problems are met, making necessary the adaptation of peculiar methods. One of these special conditions is presented by bridges over streams or roads. Wires may be run under the bridge by using short poles; wires may be run over them by using high poles; but probably one of the best ways is to eliminate the use of poles entirely and use special supports for the cross arms, hanging them from the bridge direct. The whole matter is so much one of detail and is so dependent upon the drawings that the reader is referred to the original article, which is illustrated by four excellent line drawings, making the text distinctly clear.

nterior Block Distribution—BOND.—*Telephone Journal, November 12.*

By this new system of distributing wires from the conduit or pole lines to the subscribers' premises, a cable is carried to one point in a block and the service wires are then run around the backs of the buildings, entering through the rear wall where necessary. By this method it is no longer necessary to place a terminal in a basement of one building, then carrying branches or service wires to adjoining buildings by drilling through the basement walls, etc. Many of the difficulties introduced by the new system are warranted because they offset greater difficulties of the old system.

Hints on Rural Construction—PRICE.—*Telephone Journal, November 19.*

The thing most important to do first in building any telephone exchange system is to determine as nearly as possible the relative values of the different parts of the territory as to the subscribers likely to be secured. On the basis of this forecast, which should take into account every possible source of information, the pole line routes should be laid out so as to take care of not only the immediate but the ultimate lines as well with the greatest economy. The use of aerial cable is the only escape from tree difficulties, unless the lines be put underground, and in such an arrangement of the circuits it is well not to use too tall poles. Such practice protects the cable from damage from the swinging limbs, as this interference is less in the lower parts of the trees. The article contains excellent hints on pole setting, guying and bracing.

The Traffic Manager and His Duties—STROUD.—*Telephony, November.*

OPERATING.

The duties of the traffic manager are to so arrange the circuits, apparatus and operatives that the traffic of the entire system may be cared for at all times without congestion. One of the most important features of the service the traffic manager must perform is that of providing a sufficiently large number of trunks between all offices of a large system, so that under no circumstances will a call ever be defeated because all the trunks between two offices are engaged at that instant. No subscriber should ever be told that the called line is busy when it is all the trunks that are busy. Much educational work must be done among the subscribers as a direct result of the information gained by the watchfulness of the traffic department. Personal visits by subscribers to the exchanges are of much good if they are looked after by some one in authority.

Private Branch Exchanges—JAMIESON.—*Telephone Journal, October 29.*

Private branch exchange business in Philadelphia has made its largest Independent development since 1901. A determination to develop this important branch of the business has resulted in such active work that the Independent company in that city has nearly two hundred private branch exchanges in operation, each with at least ten stations and one or more trunk lines. The charge for the first trunk line is $80 a year, and for each additional one $60. An annual rental is charged for the switchboard, and local stations are furnished in connection with the switchboard, at a rate of $10 per year. Much has been accomplished by an intelligent getting together of the company and the subscribers, so that the advantage of the private branch exchange is beginning to be understood. A large amount of the backwardness of those who need such service and do not have it is found to be due to a limited understanding of what a private branch exchange is and will accomplish, if intelligently used. An instance of a complaint from a subscriber that his lines were kept so busy with incoming calls of no importance that outgoing calls of importance could not be put through, resulted in an order for enough additional trunks for outgoing business alone to remove the trouble and satisfy a patron.

The Telephone Problem in Large Cities—HIGGINS.—*Telephone Journal, October 22.*

The automatic system is capable of supplying service to 100,000 telephones. A city may be divided into ten districts, each having a central office with 10,000 automatic switches and their necessary secondary switches.

Maintenance and Operation of Small Central Offices—O'BRIEN.—*Telephone Journal, October 29.*

In small central offices the use of minor conveniences which will effect small savings is of greater importance than in the larger offices. This installment treats of the arrangement of circuits to enable current for operators' transmitters to be economized during the periods of disuse of the set. The difference between the talking efficiency of high-resistance and low-resistance batteries is pointed out by mathematics. It is concluded that the Fuller cell meets the requirements as well as any. Valuable instructions are given with reference to the solution for this type of battery, as well as for the arrangement of local circuit and the running of battery leads.

The Private Branch Exchange—ABBOTT.—*Telephone Journal, October 22.*

Rather than being an expensive luxury, the private branch exchange is one of the most economical telephone arrangements. This is true for both the user and the telephone company. In a large way the amount of telephone service available to the customer is increased for a given expenditure by using a private branch exchange equipment. One of the chief advantages is the ability of the private branch

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exchange operator, if properly trained, to represent the concern for which she works and to expedite much business which could not be handled successfully over any equal number of lines terminating in telephones scattered through the place. There is a function here which no phase of single-line working or automatic local switching can care for. It is beginning to be realized that large mercantile establishments may receive orders by telephone with great advantage. When this is more fully appreciated a new demand will be built up among the people for residence telephones in order that this feature may be availed of by subscribers.

Measured Service Hints—STROUD.—*Telephone Journal, October 22.*

Three plans present themselves for the extensive use of prepayment measured service equipments, in which a coin or token is dropped into the telephone at the time of securing the connection. One of the plans contemplates the use of mechanism of this kind in a prominent public place as an additional service to a subscriber having one or more flat rate lines. The intention here is to divert the service of the floating population over the prepayment line, thus relieving the other lines of that burden and the flat subscriber of the necessary loss. The second plan is the use of coin-box party-line sets to educate the public into the use of the telephone in the hope that a higher grade service will be taken later. The third plan is the use of such equipments as an auxiliary to regular residence telephones, giving the latter a freedom from the necessary calls of the kitchen.

Operators' Merit System—JUDSON.—*Telephone Journal, October 22.*

As a means of reducing the elements of service tests to an expression of value of an operator's work, the report cards described and illustrated here are of great value. Competence and incompetence can be discriminated between only on the basis of some such method as this, and the general adoption of a similar one must result in a distinct improvement of local service.

Paradox in Telephone Operating—STROUD.—*Sound Waves, November.*

Most classes of business are free from such inconsistencies as are found in telephone operating. One of these is in the fact that the cost of making telephone service grows as the number of stations served in the community increases, and this leads to a decrease in the net profit, unless the rates are raised from time to time. The average business man realizes that he may reduce the cost of his commodity by buying in large quantities, but even individuals possessing wide knowledge on such general lines, fall into error in contemplating the telephone business. The flat rate rental plan of collecting from patrons of telephone service has the least flexibility and contains the least chance of escape from early mistakes. Flat rates are not easily charged even when the value of the service has been multiplied many times. The conclusion reached by an honest study of the important matter of charging for service seems always to be that the charge should be on the basis of the actual service rendered.

Telephony at St. Louis—HIGGINS.—*Electricity, November 16.*

The author believes the attendance at the Palace of Electricity would be considerably increased by opening the building in the evening. Much detail information with reference to telephone exhibits is contained in the article, and especially with reference to several types of automatic exchanges.

GENERAL TELEPHONE ENGINEERING.

The Telephone and the Election—TYLER.—*Telephone Journal, November 19.*

An illustrated description of the arrangement of apparatus and the routine of the force required to collect, tabulate, edit and prepare bulletins, and to distribute them during the period following the closing of the polls during the late presidential election. In one of the offices in New York City, 15,000 bulletins were turned out during the evening and night.

Salt Lake City System—LONG.—*Telephone Magazine, November.*

Another description of the new exchange of the Utah Independent Telephone Company, giving details of the underground, aerial and central office construction, and illustrated by a photograph of the building.

Telephone Engineering—KELSEY.—*Electrical Review, November 19.*

The twelfth installment of a series, and deals with the third stage in the growth of the Stromberg-Carlson multiple switchboard system. In this arrangement of the apparatus in the central office, two conductor cords, plugs and jacks are utilized, each line being equipped with two relays, one for lighting the line lamp, and a second for cutting off the first. Energy for operating the line relay passes to the line through the cut-off relay at all times of making a call, but as the latter is differential, it remains inert until the operator inserts a plug in the jack. During a connection the cut-off relay remains operated, removing the line relay from circuit and extinguishing the line lamp, the necessary unbalancing being accomplished by the existence of a relay associated with the cords. Another office of this cord circuit relay is to throw the two supervisory signals into action, these being in turn put out by a break under the control of supervisory relays. In another figure, associated with similar line circuits, the writer shows a variation from this type, in which the relays adapted to place the supervisory lamp in action are two, one being associated with each plug. As before, another relay serves to extinguish the lamp upon the answering of the called subscriber. Coöperating with a line circuit involving the use of a differential cut-off relay is a trunk circuit adapted to work in harmony with all the other features.

London Post-Office Telephone System—NOBLE.—*Electrical Magazine, London, October 15.*

An illustrated article, of which this issue treats of conductor distribution. Distributing joints, involving a use of seven-pair cables so as to serve small groups of subscribers, are utilized to distribute the seven conductors in lots of one pair or more per group. An illustration gives the details of splicing seven lead-covered pairs into one cable. Other drawings illustrate the complete treatment of the line from the switchboard jack to the subscriber's telephone, methods of supporting cables in manholes, plans and elevation of the latter, methods of supporting layers of cables in subways, and gun-metal linings for seven-pair cables. The details are described in an excellent manner, and it is a distinct impression of the reader that the system under description has been installed in a thoroughly painstaking way.

The Telephone in South Africa—WALKER.—*Electrical Magazine, London, October 15.*

There are 1,173 subscribers in Cape Town, 526 at Port Elizabeth, and smaller numbers at a few other places. All of the stations are operated by primary battery, 35,000 cells of various types of solution batteries being in use. It is proposed, however, to utilize the economies of central energy systems when the time arrives for remodeling any of the larger offices. In Cape Town, the figures state, there are 1,172 miles of wire underground, and a total of over 4,000 miles in the exchange. This would seem to indicate a mile of underground wire for each subscriber, and a total length of line per subscriber of nearly two miles if metallic circuits are used throughout. The underground cables are supplied with the dry compressed air system of maintenance, and this is said to be very useful. In describing the progress of telegraphy in these regions, the author comments that a great saving has been effected by abolishing registers and inaugurating the practice of reading by sound. This is similar to history which might have been recorded in America thirty-five or forty years ago. Iron poles are being adopted instead of wooden ones.

Des Moines, Iowa, city officials will prosecute persons who use telephone and telegraph poles for advertising purposes.

Independent Leader is Called

JUDGE JAMES M. THOMAS, for years the most prominent figure in the Independent telephone field, and whose critical illness was mentioned in the November TELEPHONY, died at his home at Irvington-on-the-Hudson, New York, Monday, November 7. For weeks and months Judge Thomas' family and his multitude of friends in Independent circles had been hoping against hope that his life might be spared and his career of usefulness extended to old age; but it was not to be, and the insidious malady that day by day for months had been sapping his vitality finally conquered over his physical body and he was forced to give up the unequal struggle, answering the last summons as one who "wraps his mantle about him and lays him down to peaceful rest."

The news of Judge Thomas' death, while not unexpected, came nevertheless as a sad shock to the many who had known him intimately and had been his co-workers in the stormy early days of Independent telephony. These had known the man in times of adversity, as well as prosperity; in sunshine and shadow, and had learned to love him for his kindness of heart and his nobility of character. His demise to each of this large number comes in the nature of a personal loss; they not alone experience the deepest regret at his death, but feel as well that the cause of Independent telephony has lost a great chieftain and loyal champion, who on more than one occasion had led his followers to victory, each time establishing more firmly than ever the cause of the Independents. His place will, indeed, be hard to fill.

THE LATE JAMES M. THOMAS.

James M. Thomas was born on April 24, 1858, on a farm in Clarksburg, Ross county, Ohio, where he spent his early boyhood days and laid the foundation of those manly, sturdy traits of character that marked the whole course of his conduct in after years, and won for him the homage and respect of his fellowmen. He was a lineal descendant of Samuel Thomas, who came to America in the Mayflower. As a young man he attended the Ohio Wesleyan University at Delaware, Ohio, being graduated with honors from that institution. His college days ended, he secured a position as school teacher, and his efforts in that line of work were crowned with merited success so long as he remained a pedagogue. During his spare moments as a teacher, and later as a profession, he studied law with all the earnestness of an ambitious young man who dreams of future conquests in the legal lists. As a disciple of Blackstone he showed marked talent and he was admitted to the bar of Ohio in June, 1884, his examination bringing to the surface both his innate and acquired legal ability, and moving his superiors to predict for him a brilliant career as an attorney.

Mr. Thomas first practiced law at Chillicothe, Ohio, where he soon acquired an enviable reputation, success following success in his efforts at the bar, until his fame soon became widespread and his services as an attorney in great demand. About this time he was importuned to become a candidate for probate judge of Ross county. His acceptance of the honor was followed by his election by a splendid majority, and his record in office so pleased his constituents that when his first term expired he was re-elected, his second term bringing him additional honors as a jurist. He was at one time prominently mentioned as a Republican candidate for governor of Ohio.

It was during his second term on the bench that Judge Thomas became associated with the Independent telephone movement. He acquired a considerable financial interest in the Home Telephone Company of Chillicothe (one of the organized in 1894, and which is now still in business and highly prosperous), and was elected president shortly after identifying himself with the company. His efforts in behalf of the Independent telephone cause soon gave him a wide reputation, and by the time the movement was well under way—following his great victory in the fight against the Bell company in the Berliner patents case—he was the best known man in the Independent field, and was frequently referred to as the "Napoleon of the Independent cause." When the Independent Telephone Association of the United States was organized in the city of Detroit, Michigan, in 1897, Judge Thomas was unanimously chosen president by the delegates, which office he held and filled with distinct credit to himself and honor to the association, until 1903, when he retired from the presidency and was succeeded by Hon. Hugh Dougherty of Indiana.

Judge Thomas was chairman of the law committee of the national organization, which made the famous fight against the Bell company in the Berliner patents case. The story of the mighty battle against the big monopoly, of the great struggle in the courts and of the splendid victory that was achieved by the Independents is history and need only be referred to here. The all-important part played by Judge Thomas in this fight is known to all in any way familiar with the case, and it was due to him more than any other man that the Independents were victorious. Little wonder then that the recent national Independent telephone convention referred to him as "one who has done more for the cause than any living man."

In 1899, at the expiration of his second term of office in Ross county, Ohio, Judge Thomas moved to Cleveland, where he assumed the position of general manager of the United States Long-Distance Telephone and Telegraph Company, his administration of the affairs of that organization adding fresh laurels to his fame in Independent circles. He then moved to New York, where he was a prime mover in the formation of the Telegraph, Telephone and Cable Company of America, being elected vice-president and general manager at the time of its incorporation. This company undertook to install Independent telephone service in New York city, but after eighteen months of struggling against discouraging conditions and the bitterest opposition ever encountered from Bell sources, the United States company, realizing the futility of hoping to establish an Independent system in New York at that time, retired from the

metropolis with credit, and with the full knowledge of having put up a magnificent fight against overwhelming odds.

Judge Thomas then returned to the practice of law, establishing himself at Irvington-on-the-Hudson, where his legal ability was immediately recognized, gratifying success and generous emoluments marking his endeavors there. He also within the past two years had been connected with the reorganization of the Aetna Indemnity Company, making his headquarters in New York city. He was a member of the Union League Club and the Ohio Society.

Judge Thomas was taken ill at his home last March, the malady with which he was afflicted making such marked progress that his physicians realized almost from the first that there was no hope for his recovery, and that his end was a matter of only a comparatively short time. When this fact became known to his friends in the Independent field it created a widespread feeling of sorrow, and many were the expressions of tender solicitude and sympathy received by the beloved leader as he lay upon his dying bed at Irvington. And his friends should be comforted by the knowledge that these sympathetic expressions conveyed to him brought him a sense of joy and eased the pain of his last days, for to him the sweetest thing on earth was the affection and esteem of his friends and former co-workers.

It will be remembered that at the recent convention of the National Independent Telephone Association at St. Louis there was appointed a committee to draft resolutions for greeting and good wishes to Judge Thomas. The resolutions were presented to the convention and adopted by a rising vote.

H. D. Critchfield of Chicago, who was chosen chairman of the resolutions committee, later visited Judge Thomas at Irvington and conveyed to him the sentiments of the National convention as embodied in the resolutions. The dying leader was deeply affected by this expression of brotherly sympathy and esteem and through Mr. Critchfield sent a message to his former comrades expressing his heartfelt gratitude at their action.

His end was peaceful and his passing that of the good man of whom Paul said: "He has fought the good fight; he has finished the faith." The burial of Judge Thomas took place Thursday, November 10, the funeral being attended by a large concourse of friends, attesting to the high regard in which he was held among his neighbors. A widow and four children survive to mourn the loss of a noble husband and a kind father.

Many of the foregoing facts regarding the death of Judge Thomas and his labors in the Independent field and elsewhere are gleaned from an article in the November issue of *The Telephone Magazine*, from the pen of H. D. Critchfield, embodying a biographical sketch and eulogy of decedent. It was so complete and so thoroughly covered the incidents connected with the life and passing of Judge Thomas that TELEPHONY has freely excerpted from it, as it voices the sentiments of this magazine better than could any words of our own. The following beautiful and touching tribute concluded Mr. Critchfield's article:

"Judge Thomas was a man among men, measuring up to the full ideal of 'an honest man, the noblest work of God.' He was straightforward in all his dealings with his fellowmen, and his intense earnestness in whatever he undertook imbued all those with whom he came in contact with the same spirit. It was this determination of his that carried the fight of the Independents against the Bell to such a successful outcome. He was rigidly honest and honorable, a man of kindly and generous impulses, of clean character and lovable disposition, devoted to his family and true to himself and his friends. Of his life's efforts it may truly be said that he was 'a workman who needeth not to be ashamed.' No monument that can be reared above his mortal remains will ever surpass in beauty or duration the monument of love that memory shall raise in the hearts of his fellowmen—an everlasting tribute to his worth of character, his unswerving integrity, his earnestness of purpose and his friendship. No more fitting epitaph can be carved on his tombstone than the simple words: 'Here lies a *man*.' May he rest in peace."

THE FARMER AND THE TELEPHONE.

The market gardener who sells the product of his farm in the nearby city owes much to the Independent telephone companies of the country. It is no longer necessary for him to start in the dead of night that he may have time to interview the buyers in the early morning. Instead, he makes his bargains by telephone, and a boy delivers the goods if the farmer does not want to go to the market himself. The farmer raising vegetables for the market, by following prices closely, increases his profits, for he knows when to sell to the best advantage, and by modern methods he is able to hasten or retard the ripening of his garden crops.

In other ways, almost innumerable, the telephone has come to the assistance of the farmer. By its use he can arrange for the extra help needed in the harvest time. It calls the doctor in cases of accident or illness, and summons assistance when fire breaks out. It acts as guardian of the peace and is a terror to evil-doers, who know that wherever they go through the country districts they are never far beyond its reach.

Distances are long on the farm. Here, as in the cities, the telephone may be put to many and diverse uses, in addition to its chief purpose of maintaining communication with the outside world. It is practicable for the farmer without leaving his house to talk with the men in the distant harvest field. His dwelling may be connected with his barns and granaries and these with all portions of his lands. Such uses are to-day made of the telephone, and they are destined to increase, just as the purpose to which the telephone is put in the cities are being enormously enlarged.

While the telephone is of inestimable value to the farmer as a help in his business, to no class of the people does it bring more pleasure and recreation than to the dwellers in country districts. In many sections of the country the question of finding means to keep the boys and girls on the farm is constantly and anxiously debated. Link the farm to the outside world by means of the telephone and the wires will serve to bind the sons and daughters to the old home. The telephone takes from the farmer's family its sense of loneliness and isolation, especially in the long winter months. Largely through its influence will disappear the pathos and tragedy of the lives of such women as have been portrayed by Mary E. Wilkins, Kate Douglass Wiggin, Sarah Orne Jewett and other writers of the same school. The telephone is chief among many things which the farmer of to-day is employing to give him the comforts and conveniences enjoyed by the man in the city, in addition to the freedom and delight which the country alone affords.

It was in the west that the farmers first realized the extent to which the telephone could be made to serve them. Conservative New England and other eastern sections were not so quick to grasp the idea, but in recent years there has been an awakening on the subject, and in all sections of the land the farmers' telephone lines will soon be equally distributed. Obviously, the business of providing telephone facilities must be conducted on a different basis in the country than in the large towns and cities.

Persons, firms or corporations receiving award medals at the Louisiana Purchase Exposition may reproduce the same by photograph or drawings. If they desire to reproduce them in metal the coinage must be done at the United States mint. This is the gist of a decision just made by Acting Secretary of the Treasury Taylor.

IN MICHIGAN COMPANIES MAY TRIM TREES TO ADMIT FREE PASSAGE FOR THEIR WIRES.

IT IS the law in the above state that when a company finds it necessary, in order to allow free space for stringing telephone wires, and has taken the precaution to place the poles on which the wires are to be strung in the most favorable position for the protection of adjacent trees through whose branches the wires may run, that in case it finds it necessary to trim certain branches away to admit the free passage of wires, no liability will be created against it in so doing. The statutes of the state give authority to telephone companies to erect their poles and wires along the public roads and streets. This grant of authority in the opinion of Justice Hooker of the Michigan Supreme court, in 123 M. 51, which is a leading case on this subject, carried with it the right to trim away branches, with limitation above mentioned, for "poles must be set near the sides of the roads or streets, and they are generally outside the curb or ditch line, and therefore necessarily in line with the trees. Unless they are to be placed so high as to clear all of them the wires must go through the trees." The point is suggested and it is hinted that it is yet undecided in this state whether or not in the city streets, along which are very thickly placed trees, companies would not be obliged to erect poles high enough to clear the trees. It is also the law in this jurisdiction that the erection of a telephone line along the highway does not create an additional servitude upon abutting lands. This last statement naturally follows from what has been first said.

Wyant v. Central Telephone Company, 123 M. 51.

IN LOUISIANA A JURY'S ESTIMATE IN CONDEMNATION PROCEEDINGS IS NOT NECESSARILY FINAL.

This point has been discussed in a railway case in the above state, and it was said that in estimating the value of land for the expropriation of a right of way it is not necessary to take the jury's estimate as correct. While a jury's verdict is entitled to respect, the facts and the law are considered anew by the appellate tribunal. In a condemnation case the whole controversy is reviewed on appeal. This is an exception to the general rule that a jury's verdict as to facts is conclusive.

Texas & Pacific Railway Company v. Southern Development Company, 27 South. Rep. 101.

COMPANY CANNOT BE COMPELLED TO FURNISH TELEPHONE TO A HOUSE OF ILL-REPUTE.

The question of the duty of a telephone company in regard to the above question was recently discussed by Chief Justice Clark of the Supreme court of North Carolina, and the law is so tersely and plainly stated in his opinion that the editor of this depratment deems it profitable to insert it here. The case arose through a demand by a house of this character for a telephone, and a refusal by the Carolina Telephone and Telegraph Company to comply with the demand. Mandamus proceedings were commenced to force the installation of an instrument in the particular house, and after the lower court had refused it an appeal was taken to the higher court. Judge Clark said in part:

"This is an action for a mandamus to compel the defendant to put a telephone, with necessary fixtures and appliances, in the dwelling house of the plaintiff in the town of Kinston, and to admit her to all the privileges accorded to other subscribers to the telephone exchange operated by the defendant in said town. It was admitted by the plaintiff that 'she is a woman of bad character, and keeps a questionable resort within the corporate limits of the town of Kinston, and desires to have said telephone put in said resort.' The court being of the opinion that the plaintiff was not entitled to a mandamus for such purpose, the plaintiff took a non-suit and appealed.

"There was no error. A mandamus lies to compel a telephone company to place telephones and furnish telephonic facilities, without discrimination, for those who will pay for the same and abide the reasonable regulations of the company. . . . In 17 Atl. 1071, it is said: 'A telephonic system is simply a system for the transmission of intelligence and news. It is, perhaps, in a limited sense, a common carrier. It must be equal in its dealings with all.' That case cites many authorities which are, indeed, uniform that the telephonic business, like all other services fixed with a public use, must be operated without discrimination, affording 'equal rights to all, special privileges to none.' Telephones are 'public vehicles of intelligence, and they who own or control them can no more refuse to perform impartially the functions they have assumed to discharge than a railway company as a common carrier can rightfully refuse to perform its duty to the public,' is said in Telephone Company v. Telegraph Company, 7 Atl. 811, which is another very well reasoned and instructive case on the same subject.

"Telephone companies are placed by our corporation act on the same footing, as to public uses, as railroads and telegraphs, and the corporation commission is authorized to regulate their charges and assess their property for taxation. But while it is true that there can be no discrimination where the business is lawful, no one can be compelled or is justified to aid in unlawful undertakings. A telegraph company should refuse to send libelous or obscene messages, or those which clearly indicate the furtherance of an illegal act or the perpetration of a crime. Only recently in New York the telephone and telegraph instruments were taken out of pool-rooms, which were used for the purpose of selling bets on horse races. Keeping a house of ill-repute was an indictable offense at common law and is still so in this state. . . . A mandamus will never issue to aid in acts which are unlawful. . . . It is urged that a common carrier would not be authorized to refuse to convey the plaintiff because she keeps a questionable resort. Nor is the defendant refusing her a telephone on that ground, but because she wishes to place a telephone in such a resort. A common carrier could not be compelled to haul a car used for that purpose. If the plaintiff wished to have the telephone placed in some other house used by her, or even in the house where she resided, but not kept in a house of ill-repute, she would not be debarred because she kept another house for such unlawful and disreputable purpose. It is not her character, but the character of the business at the place where it is sought to have the telephone placed, which required the court to refuse to issue the mandamus.

XUM

"In like manner if a common carrier knew that passage was sought by persons who are traveling for the execution of an indictable offense, or a telegraph or telephone company that a message was tendered for that purpose, both would be justified in refusing; and certainly when the plaintiff admits that she is carrying on a criminal business in the house where she seeks to have the telephone placed, the court will not, by its mandamus, require that facilities of a public nature be furnished to a house used for that business. . . . The courts will enjoin or abate not to aid a public nuisance."
Godwin v. Carolina Telephone & Telegraph Company, 48 S. E. 636, decided October 18, 1904.

INJURED LINEMAN SUES OHIO COMPANY.

An instructive case involving the rules of law governing the liability of a telephone company for injuries to lineman has been recently passed upon by the United States Circuit Court of Appeals for the Sixth Circuit. One Britton sued the Central Union Telephone Company in the United States District court of the above state and after trial and a verdict in favor of the defendant an appeal was taken to the first named tribunal. The facts were as follows: Britton had been in the employ of the company a short time as a second-class lineman and had been discharged on a previous trial for incompetency, but had been reinstated and after having been employed at different positions less dangerous than climbing was finally placed with the wire gang and worked up to the time of his injury as a lineman. The company's agents had notice of his incompetency. In the appeal the plaintiff urged that the defendant was bound to furnish plaintiff a safe place to work and to this end was under duty to inspect the poles before allowing plaintiff to climb them. The court said on this point:

"The practice and custom under which it (the company) conducted its operations made every lineman his own inspector, and linemen were required to make such inspection and testing of poles before going on them as they should deem essential to their own safety in doing the work they assumed to do. This case differs from Cumberland Telephone Company v. Bills (C. C. A.), 128 Fed. 272, where there was evidence tending to show that under the practice and usage of that company it was the duty of the foreman of linemen to test the safety of a pole before it was climbed by a lineman, and that the plaintiff in that case did not make such a test as he otherwise would because he relied upon the foreman doing his duty. . . . But we see no reason why a lineman, in view of the peculiar character of his work, may not lawfully contract to do any inspecting or testing reasonably necessary to determine whether he can safely climb a particular pole for the purpose of adjusting, transposing or changing wires."

"The deduction from this discussion plainly is that a company does not owe a lineman the duty to make an inspection of the poles on which the lineman is to work unless the company has adopted that custom and has allowed the employe to understand that such previous inspection has been made. If no such custom exists and the lineman has been in the habit of making the inspection for himself no liability for injury could be charged against the company for lack of inspection. In this case Britton had endeavored to make an inspection for himself, a common practice with this company's linemen, and the court said that he had no claim for damages on the allegation of failure to inspect.

On another point, however, the Court of Appeals reversed the case. Britton was an inexperienced lineman. The company employed him knowing this fact. Britton testified that he knew nothing of the dangers incident to a lineman's work, and was told nothing about how to test poles before climbing. It is a rule of law in personal injury cases that where disqualifications of a servant are brought to the attention of the master, showing the servant unfit to encounter dangers which the master knows the servant will meet, that the master must caution and instruct the servant about the dangers. This is a personal duty devolving upon the master. Facts of Britton's incapacity having been called to the attention of the company, a case was made for a jury to determine whether the company owed him the duty of instructing him in the new business before allowing him to ascend the poles. Had Britton hired out as a lineman and represented himself to be such no duty of this character could possibly be charged to the company, for it is obviously absurd to require of a company that it shall, under penalty of oppressive judgments, caution and instruct every lineman in its employ. However, when facts exist giving notice to a company that a "green" man is about to engage in the dangerous work of a lineman a duty devolves upon the company to inform the new employe approximately in what kind of business he is about to engage. To determine this latter question the court reversed the case and returned it for a new trial.
Britton v. Central Union Telephone Company, 131 Fed., 846.

PENNSYLVANIA COMPANIES ARE NOT AUTHORIZED TO TAKE PRIVATE LANDS BY RIGHT OF EMINENT DOMAIN.

In a recent case brought by the Pennsylvania Telephone Company against Charles Hoover, the company sought to test the above question. There is a statutory right conferred by clause one, paragraph 33, of the Act of 1874, which authorizes a telegraph company "to construct lines of telegraph along and upon any of the public roads, streets, lands or highways, or across any of the waters within the limits of this state." It was conceded that the act applied as well to telephone companies. The company sought to have the above words mean that corporations of this character had the right to exercise eminent domain for the purpose of erecting their lines on private property, or, as the court stated, to read the words as if written, "public roads, public streets, private lands or public highways." Section 41 of the above act was cited as indicating the legislative intention to have these words include private lands, because it is there provided that in all cases in which any corporation is permitted to take waters, streams, lands, property, materials or franchises for the public purposes thereof, and cannot agree with the owners for the compensation proper for the damage done, or likely to be done, that the damages are to be ascertained and paid. The court said that this section was general and applies to the corporations that are expressly permitted by the act to take private lands, such as a water company, which is given the express right "to enter upon such lands and inclosures, and if any injury be done to the private property," compensation is to be made therefor. The legislature having by this act expressly conferred on certain corporations the right to take private lands, the court held that it must be regarded as withheld from the others, to be incorporated under the same act to which the right is given. The court further said that the right of eminent domain to exist must be definitely granted in some way, and is not to be inferred by argument to determine intention. "That which a company is authorized to do by its act of corporation, it may do; beyond that all its acts are illegal." Inasmuch as the telephone company failed to point out expressly where the right to take private lands by eminent domain existed, the court held that it must fail in its suit. The remedy for the companies to pursue in this state is plainly to secure this definite grant of authority, either by special act or by amendment to the Act of 1874.
Pennsylvania Telephone Co. v. Hoover, 58 Atl., 922.

Governor Durbin of Indiana, in a recent address, said that the Indiana farmer of to-day, with a telephone at his elbow, an interurban line through his farm and mail delivered daily at his door, is nearer the Atlantic seacoast than he was to his county seat a few years ago.

The Telephone in Foreign Countries

IMPORTANT TELEPHONE DECISION.

THE privy council of Canada recently gave a judgment that is of great importance to every municipality in the Dominion. In the case of the city of Toronto vs. the Bell Telephone Company, it decided that the company has the right to erect poles and to lay conduits without the consent of the municipality. The telephone company got a charter from the Dominion government, and in the Quebec case of Regina vs. Mohr, the question was raised whether the company had the power to operate in the provinces without provincial consent. The company then applied to and obtained from the Ontario legislature another charter in which was inserted a clause which the Dominion charter did not contain, that the company could not operate on any street without consent of the municipality. The city of Toronto tried to hold the company to this provision and litigation ensued. Justice Street gave judgment in favor of the city, but this was reversed by the court of appeal. The city appealed and the privy council has dismissed the appeal, giving judgment for the company.

Commenting upon the decision the Toronto Globe says: "The privy council judgment which gives the Bell Telephone Company, under the corporate powers granted to it by the Dominion parliament, the right to do as it pleases on the streets and roads of every province in Canada, raises issues very much more important than at first sight might seem to be involved in it."

* * *

GOVERNMENT OWNERSHIP IN CANADA.

Indications are that the government ownership of long-distance telephone lines in Canada is not a remote possibility.

"What do you think of the possibility of the government taking over the long-distance lines?" Mayor Urquhart of Toronto was asked.

"They have been considering it for months," replied the mayor. "Sir Wilfrid Laurier told me so himself. The government had a report on the matter. It would be a good thing for the country and would facilitate the inauguration of the policy of municipal telephones."

The mayor said that the government could put the telephone system under the postoffice department, and they would be able to reduce the prices of telephones considerably.

* * *

PLANS FOR CITY OF MEXICO SYSTEM.

Jose Sitzenstatter, who recently obtained a concession from the Mexican government for the installation of a new telephone system in the City of Mexico, left on November 27 for Stockholm, Sweden, at the solicitation of L. M. Ericsson & Company of that city, who will be members of the syndicate that intends to finance the telephone plant of Mr. Sitzenstatter in the Mexican capital.

Acting upon the advice, which he has already received from the firm of L. M. Ericsson & Company, Mr. Sitzenstatter, after a conference with the Ericssons at the Swedish capital, will proceed to Warsaw and Moscow for the purpose of studying minutely the telephone plants recently installed in those cities. Mr. Sitzenstatter will study especially the manner of distribution to subscribers employed by the Warsaw and Moscow systems, particularly the latter, which is the most perfect and satisfactory, according to his statement, that has yet been devised.

Mr. Sitzenstatter intends to spend about two months in the work of studying the telephone systems of the Polish and Russian cities, and he hopes to be back in Mexico City by the 15th of February next. It is expected that as soon as he returns to Mexico the preliminary steps for the installation of the new telephone plant will be taken. According to the terms of the concession which Mr. Sitzenstatter has obtained from the Mexican government, work on the new plant will have to be started within six months from November 1. Mr. Sitzenstatter is satisfied that the construction of the plant will be commenced before the six months limit.

* * *

ONTARIO INDEPENDENT COMPANY.

The Ontario Independent Telephone Company at a recent meeting in Windsor effected permanent organization and elected officers. The company will start at once to construct its lines throughout Essex county, beginning at Amherstburg. Four hundred subscribers have already been secured in the county. The new automatic exchange system will be installed. The company's lines will extend east through Ontario. The following officers were elected: President, John H. Connelly, Windsor; vice-president, James A. McRae; treasurer, Fred J. Lawrence; secretary, A. D. Prosser; general manager, C. W. Taylor; assistant general manager, P. T. Chesley; directors, John H. Connelly, Mayor Brault of Amherstburg, J. A. McRae, P. T. Chesley, J. R. Brooks, A. D. Prosser, C. W. Taylor and Fred J. Lawrence.

* * *

THE TELEPHONE IN NEW ZEALAND.

The following interesting particulars regarding the telephone in New Zealand are taken from the report of the postmaster-general of that country for the years 1902-3 and 1903-4:

The extension of the telephone system of the country is being pushed forward, and in 1903 there were 1,161 kilometers of telephone lines, consisting of 15,823 kilometers of wire. There were 2,103 subscribers in Wellington; 1,707 in Auckland; 1,579 in Dunedin; 1,479 in Christchurch; 425 in Wanganui; 334 in Napier; 335 in Invercargill, and 320 in New Plymouth. Besides these there are about four other places with between 200 and 300 subscribers; nine with 100-200; six with 50-100; and 53 with less than 50.

Up to April 1, 1904, £1,053,692 was paid by the treasury for the construction of telegraph and telephone lines, and the following figures show the progress of the telephone service:

	Capital expenditure.	Receipts.	Expenses.	Balance.
1900.....	£162,333	43,303	46,567	— 3,264
1901.....	£176,349	49,117	45,348	+ 3,769
1902.....	£193,512	55,542	50,772	+ 4,770
1903.....	£213,966	62,151	56,277	+ 5,874
1904.....	£241,903	72,028	60,948	+10,080

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TELEPHONE COMPANIES IN NEW BRUNSWICK.

There are now three telephone companies in the province of New Brunswick, according to a recent consular report, and all are extending their lines. The oldest, the New Brunswick Telephone Company, is spreading out in the up-river counties, where the Union company, with headquarters at Florenceville, is doing the same. The Central company has its headquarters at Bellisle, in Kings county, and there is a rumor of an amalgamation of the Union and Central. If this occurs, there will be two strong rival companies in the province. The St. John city council has approved a propo-

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sition either to install a system of its own or negotiate with another company to enter this field and compete with the New Brunswick company, whose rates have been increased and are declared to be excessive. The question has been discussed, estimates have been procured, and pledges of support have been received. The question is now under further consideration looking toward final action.

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MAJORANA SYSTEM OF WIRELESS TELEPHONY.

A new method of wireless telephony is being developed by Prof. Quirino Majorana of Rome. This system, according to reports in the Italian technical press, seems to be based essentially on the practice of wireless telegraphy. In the latter a series of impulses, corresponding to the sparks, is observed at the receiver, while a stream of sparks is made to pass at the transmitting station. The receiver used enables the operator to decipher the telegrams acoustically, listening to the series of sparks. The number of sparks, however, does not exceed ten per second in the telegraph apparatus, whereas Majorana has increased this number up to 10,000 per second, though the various sparks are evidently weaker than those used in wireless telegraphy. Persons placed at the receiving station will therefore not notice anything, the succession of sparks being too rapid, and the sparks themselves too similar to one another. As soon, however, as the uniformity of these sparks is interrupted artificially by the oscillations of the human voice, every word will be transmitted truly to the receiver. The series of sparks has, therefore, to be modified under the influence of the human voice or of any other sound.

Prof. Majorana's endeavors resemble the scheme outlined by Prof. H. Th. Simon and Dr. Reich. According to the researches of these experimenters, the problem of wireless telephony by means of Hertzian waves has been solved, at least theoretically. Wireless telephony requires continuous wave currents, and these were obtained by Prof. Simon by the aid of an Arons-Hewitt mercury lamp as a vacuum spark gap, when the discharge pressure between the spark electrodes exceeded 50,000 volts, and the frequency of the spark discharge 10,000,000 per second, that is, very much more than according to Majorana.

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LIGHTNING ARRESTERS IN EUROPE.

In a recent article in *Le Revue Electrique* M. J. Blondin describes two types of lightning arrester used with success in Europe. One of these is a magnetic blow-out arrester consisting of three metal parts, arranged so as to form two diverging spark-gaps. These gaps are placed within the field of an electro-magnet. One of the outside pieces is connected to the line, the other being connected to the ground. The central piece is connected through the electro-magnet to that terminal which is connected to the line. When an arc is formed, due to an atmospheric discharge, the fact that it is divided into two parts makes it easier to extinguish it, and the tendency of the arc to rise is increased by the field set up by the electro-magnet. The other arrester is made up of a number of ovoid metal heads supported in line on an insulating bar. The number of these heads placed in series depends upon the voltage of the line. The arc established by atmospheric discharge is divided into several parts, and as these several arcs rise, they increase in length until, at the top of the heads, they merge into one long arc between the two outer heads. The resistance of the arc thus becomes so great that it is extinguished. The shape of the heads enables them to be turned on their supporting pins so as to present fresh surfaces in the gap.

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TELEPHONES IN BRIGHTON, ENGLAND.

The telephone committee, in response to numerous requests, has brought forward a draft balance-sheet and report for the half-year ending September 30, 1904. The report states that on October 5 there were 1,448 exchange lines, and in addition 21 junction lines in use. On an average 4,564 conversations are made daily, except Sundays; there are 27 public call offices, all of which are paying satisfactorily. Sub-exchanges are working at Burgess Hill with 57 lines, Portslade with 33, and the Shoreham exchange has only just been opened. Exchanges at Hurstpierpont and Steyning are in course of construction, and will be opened shortly. The addition to the switchboard at the Central exchange has been completed, and the whole board now has a capacity for 2,088 subscribers, and 48 junctions. It provides switchboard accommodations for more than 2,000 subscribers, and there are in use and on order 2,000 instruments. Cables are laid to supply more than 2,500 subscribers.

The financial position of the undertaking is also claimed to be satisfactory. It is said that the next 500 subscribers can be connected at a very small cost for labor, and practically these rentals will be all profit, as the working expenses and capital charges will be very little increased. After charging working expenses, interest, and sinking fund of the £42,000 loan already taken up, an approximate revenue account for the half-year shows a profit of £98 7s. 7d., after allowing £30 for bad debts. The annual revenue of the department at the present time is £6,411 7s. 8d., the amount having increased during the past six months at the rate of £411 per month. The telephone committee decided to charge canvassers' salaries to capital account when obtaining new subscribers during the first year.

* * *

LONDON TELEPHONE OPERATORS COMBINE.

The newly formed National Association of Telephone Operators in London, England, recently held a meeting at which Miss McArthur of the Women's Trade Union League presided. She stated that already the association had most of the telephone employes in London enrolled as members, and also had a satisfactory balance at the bank. The programme which had been drawn up by the association included the question of increased minimum wage, alteration in the sick-pay rates, a larger salary increment, and the system of promotion.

* * *

TELEPHONES IN COLOMBO.

The telephone is becoming more extensively used in Colombo since the metallic circuits were completed. The number of instruments in use has risen from 228 in 1902 to 250 in 1903, and the wire mileage from 308 to 354 miles. Copper and bronze wires are chiefly employed, but the streets in the town are so narrow in the vicinity of the postoffice, that the superintendent of telegraphs finds great difficulty in extending the exchange system with overhead wires. Probably overhead cables would relieve the congestion were they employed for the more distant subscribers. A scheme of some sort is under consideration. The same official considers that the charges are too high to expect any development among occupiers of private bungalows. The number of calls at the exchange increased by 68 per cent in 1903, and the number of complaints decreased from 486 to 332, which is a proof of the growing efficiency of the service.

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TELEPHONE NOTES FROM ABROAD.

A number of towns on the northern coast of France are now connected with London by telephone. The charge is $2 for three minutes.

The Danish collier SS. "Bretland" is fitted with a telephone system, permitting the captain to give orders and receive reports without leaving his berth.

The Association of Telephone Subscribers in Paris, which was recently organized to protect subscribers' rights against a too haughty administration, held a meeting recently, at which President Marquis de Montebello announced highly successful results of the campaign inaugurated. The admin-

istration promised not to suspend subscribers without good reason hereafter, and also to increase the number of operators.

J. B. Gibbons, a representative of the Oriental Telephone and Electric Company, Ltd., recently surveyed the telephone system of Madras, with a view to placing the wires underground.

In London, according to the latest statistics, there is only one telephone for every sixty families. In New York there is one for twelve, in Boston one for six, in San Francisco one for four.

The International Telephone Company, composed of Fort Frances, Ontario, capitalists, has been formed and is at work putting in an Independent telephone system for Fort Frances.

The British postmaster-general has informed the Liverpool Chamber of Commerce that he is investigating the desirability of establishing a direct telephonic communication between Liverpool and Antwerp.

The last section of telephone cable that will give Victoria connection with the mainland—that between Telegraph Bay, V. I., and San Juan Island—has been laid and all the cables have been tested and found to work satisfactory. Fog delayed the work slightly, but otherwise there was no hitch. The land lines are also finished.

The Rainy River International Telephone Company, Limited, has been granted a charter in Ontario, Canada, to carry on business with the usual powers and restrictions, the provisional directors being Donald Robertson, J. A. Mathieu and Percy Roberts, Rainy River; P. A. Smith, Herb Williams, and H. J. F. S. Sisson, Fort France.

The work of laying underground telephone cables in Manchester, England, to replace overhead wires is preceding apace. In all, over 100 miles of ducts are being laid. Under the new arrangement the corporation will receive a rental of £1,690, which will increase as more subscribers are connected and more junction boxes put down. When the work is finished there will be no cases of telephone wires swinging above the tramway trolley wires.

According to the foreign press, Herr Valdemar Poulsen, the inventor of the telegraphone, has now completed a new apparatus for purposes of wireless telephony. The official announcement regarding the invention, which has been sold to an international company, will not be made known for some weeks. It is further stated that the invention renders it impossible to "tap" wireless messages, whilst it can also be used for exploding torpedoes at a considerable distance.

A consular report, quoting from a leading German trade paper, says: The imports of electrical, telegraphic, telephonic, etc., apparatus into Egypt during the years 1901, 1902 and 1903, were valued at about $210,000, $276,000 and $338,900, respectively. Of these Great Britain led with the lion's share each year. The writer, commenting on the foregoing, advises anyone wishing to sell to Egyptians to establish representatives of the first class in Cairo and Alexandria.

The question as to the status of Paris telephone girls, raised at the time of Mlle. Sylviac's prosecution, has been settled definitely by the decision of the Correctional Appeal Court, in Paris. M. Boulloche, who was prosecuted about the same time as Mlle. Sylviac for the use of offensive language to telephone girls and condemned to a 100f. fine, was acquitted, the court finding that telephone employes are merely public servants, not functionaries or representatives of authority.

The official bulletin of the Italian postoffice department gives in its latest issue interesting details of this latest invention of Signor Cattini. It is an instrument by which one is able to utilize a writing machine in order to send or receive messages over the telephone. If the person sought for should not be at the receiver, the machine, left in contact, will write the messages, moving the corresponding keys of the typewriter as in the sender's machine. Messages can also be sent to several persons simultaneously.

KEYSTONE CONDUITS SOLD FOR $2,500,000.

The Philadelphia Electric Company, it is announced, has purchased the Keystone Telephone Company's conduits and franchises, paying therefor $2,500,000 cash. In turn, the Keystone company agrees to use the conduits and pay an annual rental therefor to the Philadelphia company of $125,000. For any additional space after the sale is made the Keystone company will pay at the rate of four and one-half cents a foot for each separate duct used. It is understood that the money for this purpose will be raised by a loan, and that there will be no further assessment on Philadelphia Electric stock because of this purchase. One of the agreements incident to the deal is that the Philadelphia Electric Company shall not engage in the telephone business. Under the terms of the negotiations the Keystone company will continue its business, the only difference being that it will act solely under its charter, and will lease space in the conduits it has sold.

A WIRELESS TELEPHONE.

Telephoning without wires is not a dream, but a reality. It has been realized in a practical way by A. Frederick Collins, the wireless expert. Some time ago he began the task of placing his wireless telephone outfit on two of the ferryboats of the Erie railroad system, the boats running regularly across the Hudson river between New York and Jersey City. With the apparatus installed in all its details, the inventor took his position on one of the ferries. As the vessels sighted each other the gentleman in each ferry placed the receiver to his ear, and each in turn heard a somewhat similar sentence: "Hello! hello! This is the voice of the wireless telephone. Do you hear what I say? One, two, three, four, five. That's all. Good-bye." The words had come over from the communicating ferry at a distance of from 500 to 1,000 feet, and then gradually became indistinct.

It will be seen that the distance over which the wireless telephone can be made to work effectively is very short—a few hundred or a few thousand feet at most. Between boats where the conditions are all different the inventor at present claims only a thousand feet. The first impulse upon learning the limited range over which the invention is at present effective is to question its utility; but rivermen and all who have business to transact between boat and boat, and between boat and shore-point, can readily see the serviceableness of the system, even in its present state of development.

The wireless telephone is not adapted to social purposes at present, for the reason that the instruments have no selective power—in other words, a message sent out from any given transmitter would be taken up and made audible by every receiver within range of the system. But this admitted defect by no means renders the invention unserviceable, nor is it a defect peculiar to the new telephone. The wireless telegraph has the same shortcoming. In estimating this invention, therefore, these two facts should be borne in mind—namely, that the lack of selectivity is by no means a fatal barrier to the system's utility, and those most competent to judge believe that inventive genius will in the near future remedy whatever defect may at present inhere in the system on this account.

A Pittsburg judge has decided that the man who swears when talking over a telephone can be arrested and fined. Fortunately what a man thinks is not actionable.

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In the Financial Field

LOUISVILLE HOME TELEPHONE COMPANY.

ACCORDING to the Louisville *Courier-Journal* an attempt is being made to pool the bonds and stock of the Louisville Home Telephone Company and the indications are that a dividend will be declared by January 1. The Utica (N. Y.) Independent Home Telephone Company has pooled issues, with the result that the bonds are now quoted at 90, and the indications are that as soon as the Toledo Home Telephone Company gets out of litigation, a similar deal will be put through there. The Springfield & Xenia Telephone Company is also on the schedule, and it looks as if a general consolidation of interests and advancement of prices is on the map. Commenting on the situation at Louisville the *Courier-Journal* says:

"An effort is being made to induce the Home Telephone Company to pay dividends on its stock. H. R. Ashbrook, a broker of Toledo, is here for that purpose. Mr. Ashbrook has had talks with all the directors of the company, save one, who is now out of the city, and the matter may be considered at the regular meeting of the directors to be held shortly.

"Mr. Ashbrook claims that the company is pursuing a mistaken policy in taking surplus earnings to pay for necessary extensions. If this policy is kept up, he says, and the company continues to grow with the growth of the city, the stockholders will stand a poor chance to secure dividends on their holdings for a number of years. What he contends is that experience teaches that a telephone company should charge to capital account such extensions as many be necessary from time to time, and that bonds should be sold to pay for same. He says that the company is earning between five and six per cent on its stock, and is amply able to commence paying dividends on a two per cent basis and continue to increase them as the business grows. This, he says, should give the common stock a value of fifty cents on the dollar and make the bonds of the company sell into the nineties.

"Mr. Ashbrook is a large individual holder of the stock, and he controls other stock under an option, in all about 3,000 shares, or about one-fourth of the total capital. He insists that dividends should be begun without delay for the best interests of both the stockholders and the company, and says that he believes the directors will agree to pay two per cent, beginning January 1, and that action to that effect will be taken within the next ten days.

"Mr. Ashbrook points to the fact that the company has authorized $2,500,000 of five per cent bonds; that it has $1,400,000 of these outstanding, less $120,000 now held in the treasury for extensions. The company has been unwilling to sell bonds, owing to their low market value, to pay for extensions. He says that this $120,000, together with the remaining $1,100,000 authorized, will give the company bonds sufficient to pay for extensions for some time to come and that a dividend declared on the stock would immediately enhance the value of the bonds.

"So much for what Mr. Ashbrook says. What the Home Telephone Company directors altogether believe in the soundness of his contention is another thing."

Mr. Ashbrook's letter to the Louisville Home Telephone Company is as follows:

To the Board of Directors of the Louisville Home Telephone Company, Louisville, Ky.:

After interviewing many of you gentlemen, I am inclined to believe that the major portion of you coincide with me as to the best policy to be adopted for the future welfare and progress of your company's interests in whose future I am interested from both the point of a bondholder and a stockholder, holding personally 1,000 shares and representing an additional 1,500 shares.

Your universal argument to not paying stockholders a dividend is that you have not on hand the necessary funds, though you have earned net between five and a half and six per cent on the capital stock. This surplus together with some $40,000 to $60,000 has been expended on extensions and additional construction.

When this company was organized there were authorized $2,500,000 bonds and at the present time you have outstanding $1,432,700, leaving $1,067,300 bonds still in your treasury, which according to your mortgage, are to be used for future extensions.

Of this $1,432,700 you have up as collateral some $120,000 of these bonds to secure your bills payable of $60,000, and your excuse for not selling these bonds, thereby wiping off your floating debt and enabling you to pay your stockholders a fair dividend honestly due them, and still leave you a handsome surplus, is that no dividends should be paid until you have the actual money on hand. I want to say to you that so long as you pursue this policy you will be up against this same condition of affairs, so long as you continue to utilize all your surplus earnings for betterments and extensions, you will be worse off financially five years hence than you are to-day.

The idea, which one of your directors favors, to stop where you are, quit extending, let 7,000 connections suffice, is contrary to the policies now pursued by experienced telephone men, and if followed out, would cause your company to deteriorate rather than continue the wonderful progress you have made on the inroads of the business of your competitors.

The great enemy of all Independent telephone companies, namely, "the Bell," would want no more appetizing news than to learn that its heretofore fearless and progressive opponent was now going to lie down and quit. It has been the history of all well managed Independent telephone companies in growing cities like Louisville, that it was constantly necessary to extend its conduits, cable, poles and general equipment for the natural increase of business, and I am sure it is the policy of your capable management to do this in Louisville, but how? Certainly not out of your earnings, but from the sale of your bonds, which are there for that purpose.

If you do something for your stockholders in the shape of dividends your securities will find a ready market at an honest price. If you do not when all your surplus earnings are spent and respent in the improvements and extensions which are bound to come, you will not only be unable to sell your securities at, I may say, fifty per cent of their par value, but your banks will be slow to loan you money on securities which they will be unable to sell.

COMPANIES NOT FOR SALE.

Col. Dickson, president of the Federal Telephone Company of Cleveland, was recently approached by a broker of good standing and financial backing, and asked for an option on the control of the United States Telephone Company and the Cuyahoga Telephone Company. Col. Dickson replied that he would not talk the matter over until he knew absolutely who desired the properties, and why they desired them, stating further that neither of the companies would ever be sold save to strong Independent telephone men. Col. Dickson is known as one of the best telephone financiers in the United States, and he regards the future of both the Cuyahoga and of the United States as being of the very best.

"The situation with regard to the United States is unusually strong," said Col. Dickson, "and I will tell you why. The strip of territory which stretches from the Great Lakes to Cincinnati and the Ohio river is the gateway between the great commercial centers of the east and the great commercial west. All of the freight destined for the west must pass through Ohio and all of the telegraphing and telephoning must pass through Ohio. This is the territory that is occupied so far as the Independent telephone people are concerned, exclusively by the United States Telephone Company. It is the vital point in the whole situation, and we

believe that we have the very best Independent long-distance plant in the United States. We hold the key to the situation and we are not disposed to sell at anything less than a fair price.

"The property, as is well known, is not for sale, but every man will sell when he gets his price, and we will do the same provided the buyer represents strong Independent telephone interests. However, I do not believe there will be a sale of the United States or Cuyahoga company, and I do believe they will be developed to their full capacity by the Everett-Moore syndicate and will eventually be two of the greatest earners in the telephone business, either Bell or Independent, in the United States."

BIG TELEPHONE DEAL MADE.

One of the most important telephone transactions recently made was the big deal consummated by Barber & Brailey in connection with their Utica, New York, plant. A Toledo correspondent says:

An important deal in telephone bonds was closed at Cleveland when Barber & Brailey, the Independent telephone operators of Toledo, sold to a syndicate of capitalists, composed principally of Rochester men, the bonds and stock of the Utica Independent Home Telephone Company on a basis of 87½ for the bonds. The securities have been pooled for a term of years. Ed. L. Barber and James S. Brailey went to Cleveland, where they had an appointment to meet the eastern men, and a telegram was sent to Toledo announcing the completion of the deal. The amount of bonds involved in the transaction is $75,000, Barber & Brailey transferring their entire interest in the Utica plant to the syndicate. The bonds and stock purchased are now off the market.

Last spring the Toledo men gave an option on the bonds to the same parties at 82½, but when the option expired in August the New Yorkers did not renew it. Some time after the lapse of the option, however, the syndicate wanted a renewal on the old terms, but Barber & Brailey boosted the price five points. The eastern men were determined to obtain possession of the securities and had the option renewed on the basis of 87½, at which figure the bonds were turned over to the Rochester men. The syndicate is composed of two Rochester trust companies and several individual capitalists.

James S. Brailey said in regard to the sale of bonds: "The truth of the matter is that when they allowed their option to expire we were glad, for the bonds are worth more money and are a good buy at 87½. We believe those eastern Independent telephone securities are a fine investment and will constantly enhance in value."

It is thought by those who have followed closely the trend of financial affairs in Independent telephone securities that it is only a question of time when pooling arrangements similar to the Utica deal will be made in the Toledo, Springfield and Louisville properties, and that the bonds and stock of all these concerns will be taken off the market. The recent flurry in Toledo and other telephone bonds on the local exchange would seem to point that way, for all the securities that have recently been sold have gone into the hands of permanent investors.

DELAWARE & MADISON COUNTIES COMPANY.

The following is a comparative statement of the Delaware & Madison Counties Telephone Company of Indiana for September, and for the nine months ending with September:

	Sept., 1904.	Sept., 1903.
Income from rentals	$6,526.77	$4,442.50
Income from tolls	1,535.84	818.82
Income from building	135.00	135.00
Allowances	48.79	32.43
Gross income	8,148.82	5,363.89
Operating charges, taxes and insurance	3,853.36	3,593.39
Net income	4,295.46	1,770.50
Interest	1,744.16	1,487.50
Surplus for stock	2,551.30	283.00

Statement for nine months ending September 30:

	1904.	1903.
Income from rentals	$55,149.33	$35,946.80
Income from building	1,215.00	1,215.00
Income from tolls	11,427.58	5,472.29
Discount	149.90	7.96
Allowances	598.82	1,070.65
Gross income	67,342.99	41,571.40
Operating charges, taxes and insurance	33,210.57	24,406.88
Net income	34,132.42	17,164.52
Interest	15,560.85	11,467.01
Surplus for stock	18,571.57	5,697.51

TWIN CITY TELEPHONE COMPANY.

The Twin City Telephone Company, the Independent telephone company operating in Minneapolis and St. Paul, makes the following statement of income account for the year ending October 1, 1904:

Gross earnings		$434,570
Operating expenses		197,755
Net earnings		256,244
Interest		50,000
Surplus for stock		186,244
Preferred dividend (7 per cent)	$35,000	
Common dividend (5 per cent)	50,000	85,000
Surplus		101,244

The company has a capitalization of $1,000,000 five per cent bonds, $500,000 preferred stock, and $1,000,000 common stock.

Quarterly dividends on the preferred stock have been paid regularly since May, 1902. A semi-annual dividend at the rate of five per cent per annum was declared on the common stock July 1, 1904.

The company has in operation 12,923 telephones.

BRIEF FINANCIAL NOTES.

Nearly $11,000,000 is invested in Independent telephones in Pennsylvania.

The Graniteville (S. C.) Telephone Company has increased its capital stock to $10,000.

The Burton (Ohio) Telephone Company has increased its capital stock from $15,000 to $25,000.

The Chardon (Ohio) Telephone Company has increased its capital stock from $25,000 to $50,000.

The Farmington (Conn.) Telephone Company has declared a semi-annual dividend of three per cent.

The Pierce County (Wis.) Telephone Company has increased its capital stock from $10,000 to $30,000.

The Mount Zion (Ind.) Telephone Company has increased its capital stock from $8,000 to $20,000.

The Marshall (Mich.) Telephone Company has increased its capital stock from $15,000 to $50,000.

United States Telephone preferred stock has received the regular quarterly dividend of one and a half per cent.

The Kirtland Telephone Company of Lake County, Ohio, has increased its capital stock from $25,000 to $50,000.

The Belvidere (Ill.) Telephone Company at a recent meeting declared the usual quarterly dividend of two and a half per cent.

At a meeting of the Wytheville (Va.) Mutual Telephone Company it amended its charter so as to issue $3,000 worth of preferred stock.

The telephone exchange installed at Hardy, Nebraska, at a cost of $6,000 has about 200 subscribers and is proving a fine investment for those who installed it.

The annual report of the Rushville (Ind.) Co-operative Telephone Company shows receipts for the year in excess of $15,000, with disbursements of $14,664, the balance being $440.13.

The Citizens' Telephone Company at Grand Rapids, Michigan, has just paid its twenty-ninth regular dividend of two per cent, which was declared at a recent meeting of the board.

The board of directors of the Inter-State Independent Telephone and Telegraph Company held a meeting in their offices at Aurora, Illinois, and declared their fourteenth quarterly dividend.

The Northern Colorado Independent Telephone Company's holdings were foreclosed at Greeley, Colorado, by the public trustee of Weld county under a deed of trust for $16,400. The purchaser was Mort Parsons.

Thorpe Brothers of Minneapolis have just finished distributing $50,000 Twin City telephone bonds at a price

around 95. This transaction completes the passing of these securities from the hands of local bankers to those of local investors.

The United States Telephone Company has filed a mortgage to the Cleveland Trust Company covering all its present lines and lines to be built in the proposed extensions from Dayton, Ohio, to Richmond, Indiana, and also from Uhrichsville to Cadiz. The mortgage is for $1,000,000 and is given to secure outstanding bonds and bonds yet to be issued.

Despite the advice of the Peoria, Illinois, city attorney to the contrary, the city council at a recent meeting declared by a vote of eight to seven that the Inter-State Telephone Company is entitled to the $20,000 deposited with the comptroller, it being maintained that the money was only a guarantee for the expenditure of a certain amount of money and not that a plant should be equipped.

In Los Angeles, California, recently ten shares of Home Telephone stock were sold at $47, twenty shares at $47.50 and two blocks of ten each at $47.62½. On December 31, 1903, the net profits, or dividend account, of the Home company showed $22,359.61; the next quarter, $36,847.12; the third quarter, $54,342.95, and on September 30, 1904, $72,-183.27, a gain, in nine months, of $49,823.66.

The Jefferson & Warren Telephone Company of Orangeville, Ohio, was organized in 1896, and now has 875 telephones. The company has just paid its twenty-fifth quarterly dividend. It has an authorized capital of $80,000 and an outstanding capital stock of $73,175. The statement for the year ending October 1 is as follows: Gross earnings, $16,049.41; operating, $9,051.01; net earnings, $6,998.40.

At a recent meeting of the stockholders of the Citizens' Telephone Company of Racine, Wisconsin, held for the purpose of discussing matters pertaining to the corporation and extension of the plant in the future, the directors were instructed to issue $200,000 bonds for improvements and extension. It is the purpose of the company to put in the best, most modern and improved plant it is possible to secure. Among the improvements will be the construction of a modern fireproof building, which will cost $15,000 and will give a capacity of 5,000 telephones. The company now has 2,000 telephones and its lines extend north and south for many miles. This is purely a home company. All of the stockholders are residents and property holders and no difficulty is anticipated in disposing of the proposed new stock issue.

THE MORE BUSINESS THE LESS PROFIT.

An engineer explaining the apparent paradox that the more business a telephone company does the less profit it makes per subscriber, says that the switchboard in the exchange is built in sections, each of which contains on an average the terminals of the lines of two hundred incoming subscribers. These terminals are called "jacks," and the panel containing them is called the answering panel. In addition to these 200 incoming jacks, each section must contain the outgoing jacks of each subscriber in the exchange. This is necessary in order that the operator in each section may be able to connect any of the incoming subscribers in a section with any other subscriber in the exchange. The panel containing these outgoing jacks is called the multiple panel. On the above basis the switchboard in an exchange of 2,000 subscribers, would contain ten sections, that of a 5,000 exchange twenty-five sections, and that of a 10,000 exchange fifty sections; consequently each section in exchanges of these capacities would contain respectively 2,200 jacks, 5,200 jacks, and 10,200 jacks.

The total number of jacks in a 2,000 exchange is therefore 22,000. The average mind would at once arrive at the conclusion that the total number of jacks in a 5,000 switchboard would be two and one-half times that of a 2,000 (or 55,000), and that the total number in a 10,000 switchboard five times that of the 2,000. A 5,000 capacity switchboard, however, would contain twenty-five sections of 5,200 jacks each, or a total of 130,000, while a 10,000 capacity switchboard with its fifty sections of 10,200 jacks each, would contain 510,000 jacks. For sake of argument, we will say that each jack with its connection and labor, represents a cost of $1. Each new subscriber added to a 2,000 exchange has to be multipled into ten sections, necessitating ten jacks; but each new subscriber added to a 5,000 exchange has to be multipled into twenty-five sections, requiring twenty-five jacks; while each new subscriber added to a 10,000 exchange has to be multipled into fifty sections, requiring fifty jacks.

Now, as to the number of "hello girls" necessary to operate exchanges of the size mentioned: While one operator can take care of each section of a 2,000 capacity switchboard, the larger exchanges require three or more operators per section, besides assistants, relief operators and monitors. It is, therefore, evident that a company starting out with 2,000 subscribers, on a basis of say $50 per year for service, makes less profit on each 200 subscribers added; and such is the decrease in the profit as the exchange mounts up to 5,000 or 10,000 that the company must either increase its rates or quit. One of the most interesting exhibits in the St. Louis Exposition is that of the invention of a German named Faller, who has succeeded in eliminating the multiple feature, not only from automatic practice, but also from present manual practice.

GREAT FUTURE FOR CUYAHOGA.

President Dickson of the Cuyahoga Telephone Company, at Cleveland, reports conditions improving very satisfactorily with that company. Since the new switchboard was cut over last March the company has made an addition of 3,000 telephones in actual operation and now has over 13,000 telephones installed and in use. New telephones are being cut in at the rate of from 400 to 500 a month and Col. Dickson is positive that this rate will increase, or at least continue, until the company has from 16,000 to 20,000. The service given by the Cuyahoga Telephone Company just now is unusually good and compares very favorably with telephone service anywhere in the United States. An investigation of the number of grocers using the Bell and Cuyahoga telephones in Cleveland shows that there is not a grocer in Cleveland who uses any telephone who does not use the Cuyahoga. There are 138 grocers who use the Cuyahoga, but who do not use the Bell. Colonel Dickson is quite positive that during the year 1905 the Cuyahoga Telephone Company will earn at least four or five per cent on its common stock.

SHOOTING AT INSULATORS.

"Talk about your troubles," said a telephone manager in the upper peninsula of Michigan, "maybe this opening of the hunting season won't make them for us. We are having them already. The people on the south range have troubles with their telephones and of course we get the blame. We try to explain that it is not our fault. Hunters out on the range seem to like the insulators as targets. They shoot at them every time they get a chance and I can assure you that they are pretty good shots at that. The number of insulators that are broken runs into hundreds. Every spring we have to go out along the range with half a dozen barrels loaded with insulators and replace those which have been destroyed by the hunters. There are seasons for this and seasons for that, but the open season for insulators is all the time, seemingly."

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Operating Trains by Telephone

MATTHEW C. SMYTHE

THE longest private telephone lines in the world are those used by American railways, and the telephone is becoming so essential a part of railroad management that it is even being employed to some extent in the handling of trains. Though opinions differ about doing away with the telegraph entirely in operating trains, some very interesting trials of the telephone in its place are now being made, and in several instances immense sums of money have been expended by railroads in constructing private telephone lines extending over long distances, for use in operating trains and moving traffic. The telephone system recently put in operation between New York and Chicago by the New York Central and Lake Shore railroads is a notable example of this. Its total cost is said to have been more than $200,000. The results already obtained are said to be highly satisfactory to the management of these two roads, and it is believed that it is only a question of a comparatively short time when long-distance telephone service will entirely supplant the telegraph ticker as a medium for train dispatching on the Vanderbilt system.

The Erie railroad company is the latest to plan the construction of a private telephone system. It has invited estimates from telephone equipment companies for the cost of installing a complete telephone system between Cleveland and New York. The estimates will include the cost of necessary copper wire and the cost of stringing it. The establishment of a private telephone service to the general offices in New York will relieve the overtaxed telegraph service of the road. There will be branches from the service extending into all way stations, and any agent of the company will be able to call up his officials at headquarters and hold personal conversation with them when occasion demands.

The Erie now has a private telephone connection between its general offices in New York and the division headquarters at Galion. The service is not so complete as the new service will be, because all communication now is had over the regular telegraph wires. The new system to New York will be distinct from the telegraph service, and strictly telephone wire will be strung. It is planned by the company to extend the system to Chicago on the completion of the wire to this city, thus affording free communication between far western and eastern terminals without the delay and inconvenience of using the public telephone service.

On a freight line which the Pennsylvania road has recently constructed in West Philadelphia the telephone has superseded the telegraph altogether in train management. The departure will be watched with great interest by railroad men the country over, for its success may mean the general adoption of a new order of things in one of the most important departments of their business.

Now, on thoroughly equipped railroads, as a train rushes along on its journey its passage from block to block is reported by the ticking of telegraph keys. It flashes past a signal station—one of those little, yellow painted structures by the side of the tracks; immediately a semaphore assumes a position which says "Stop" as plainly as if the word was painted in letters six feet tall, and no other train may pass that way so long as the warning arm is upraised. When the next signal station is passed, the telegraph gives notice that the train is safely by and the operator back at the first point moves the semaphore to the position which indicates that the track is clear. If the use of the telephone in place of the telegraph in this way proves feasible, it will be no longer necessary that the men in the signal towers should be telegraphers and, what is more important, the towermen will have a means of instant oral communication, which offers several advantages over the old-fashioned method.

Whether the telephone is adapted to general use in train dispatching is a question on which railway men have widely differing opinions, but there is no doubt of its success in the intricate operations of the largest railway yard in the world, that of the South Terminal station in Boston. Here nearly 900 trains arrive and depart every day and the opportunities for delay are innumerable. The maze of tracks—there are thirty that terminate under the trainshed alone—is spanned by steel bridges bearing the semaphores, and from the switchtowers that control both rails and signals radiate telephone wires to all parts of the yard, the telephone being used exclusively in transmitting orders and intelligence.

That everything may be prepared and a track cleared in advance so there shall be no waiting, the controlling tower in the South Terminal yard is notified of the approach of every incoming train by telephone from a watchtower a mile out along the lines. And when the fog rolls in from the harbor and the smoke hangs low, making it difficult for the engineer to see lights or semaphores, men stand at the bridges in the yard to "signal in" by hand the ponderous "limited," the more patient accommodation and the busy little switching engines. At such times, the men in the towers can see only a short distance, but the watchful eyes of the lookouts identify approaching trains, and their presence is reported to the towermen they must pass by means of the telephone attached to the bridge structures.

As supplementing the telegraph, railway managers have found the telephone an indispensable ally. Take, for example, the case of a wreck, one of the calamities that occasionally visits even the best regulated roads. The wrecking train makes a quick run over a track from which all traffic has been cleared to leave it unobstructed, and until it arrives there is often very little idea of just what the matter is. Quite likely it is ten miles to the nearest telegraph station; but the wreck-master, with his portable telephone set, taps the long distance wires which stretch by the side of the road and is immediately in communication with headquarters. He can describe the situation and tell what is needed much more clearly in direct conversation than he could by telegraph even were there an instrument and operator right at hand. At division headquarters the railway has its own telephone switchboard connected not only with the various departments, but also with the houses of officials, and the general manager, perhaps at his summer home some distance from the city, can be immediately placed in communication with the men in charge at the wreck and give such special instructions as he may wish.

But it is not alone in the case of a great wreck that the railway manager finds the telephone of value. He has come to rely upon it in the scores of smaller mishaps which require prompt action if traffic is to be kept going smoothly. A western railroad man tells a story of such an occurrence when part of the mechanism of a steam shovel broke down and threatened a serious delay, which, of course, meant a large loss of money. By the use of the telephone he was able while standing at the side of the track, several miles from the nearest town, to reach the works of the manufacturers and order what was needed to make the repairs.

When the telephone first came into general use the rail-

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roads already had elaborate telegraph systems and naturally were loath to displace them at once. But little by little, as the telephone showed itself nearly indispensable in the management of other enterprises, it found a place in the intricate methods by which great transportation lines are governed. The fact that the eletrical impulse which transmits the sound of the voice does not interfere with the current which carries the telegraph message, makes it possible for railroads to use what is described as a composite system, telephone and telegraph instruments both employing the same wires. Of course, telephoning over such as the telegraph uses, is not so satisfactory as it is on specially constructed lines of copper, so some of the great railway systems, notably the Pennsylvania, Illinois Central, New York Central and Lake Shore, have built regulation telephone lines.

The list of railways which now make extensive use of the telephone is a long one, including practically all the great systems of the United States. The number of private branch exchanges operated by transportation companies runs into the hundreds and they connect thousands of stations. In fact, such has the demand for this sort of service become that the Bell people have devised special sets of apparatus and maintain a special department devoted exclusively to the railway business.

While the running of trains by telephone on steam lines is still regarded as more or less of an experiment, the telephone has been used for a number of years in the operation of electric roads and a number of ingenious pieces of apparatus have been devised to facilitate this application of the telephone. Thus conductors have been provided with portable instruments which they can connect with the wires when they want to talk with headquarters for any reason. Again, many cross-country trolley lines of up-to-date equipment have regular telephone stations in weather-proof boxes at every turnout where cars pass each other, so the dispatcher can keep constant control of all cars out on the line and issue orders in case of an interruption of traffic or other emergency. Mechanism has also been devised by means of which the flashing of signal lamps upon the trolley poles calls the attention of conductors and notifies them to communicate with the offices of the company.

Up to the present the efforts of railway managers have been devoted chiefly to making the telephone of value in the operation of their roads, but some experiments have been made with a view to enabling passengers to talk by wire while on their travels. Although no practicable means have yet been found by which people on a moving train may communicate in this way with those outside, trains have been equipped with telephones, just as hotels are, so that passengers in one car may talk with those in another without leaving their seats, and on the electric road which climbs Mt. Tom in the state of Massachusetts, the conductor and motorman of each car are kept in touch with each other by a similar system. When a train is at a standstill it is possible, of course, to run a wire into the cars so that passengers may talk over it with anybody in reach of the local exchange and this is done regularly at some places where trains make a stop of more than a few minutes.

The adoption of the methods of distributing train orders so long followed by railroads, by the electric roads, is of recent date. The radical difference in the instruments used, however, makes the electric roads at least one degree further advanced, according to railroad men. This is the use of the telephone instead of the telegraph.

The writer has in mind an electric railway system in an Illinois city, where the movements of all the cars on the different lines of the road—and particularly the interurban branches—are directed by the use of the telephone. The dispatcher conducts his operations in a little room over the main office of the company. Two baize covered tables are arranged in the middle of the room. Upon each lies a huge sheet of paper. Spacings and rulings cover the surface. A telephone on either table and a few trivial appliances constitute the remainder of the materjal required.

The dispatcher seated at one of the tables has before him constantly the form sheet that indicates the running time of every car on the line. Opposite each station is a space for the annotation of the train number. Electric cars are classified as trains and designated as on the steam roads by number, and the name of the motorman and conductor are properly recorded.

At intervals along the road, usually at the switches and sidings, are telephone attachments that are connected directly with the dispatcher's office. At bridges are additional devices for the attaching of the circuit connector carried on the cars. When a car arrives at the point where a communication is required, the motorman opens the window of the car and thrusts out a long wooden rod. At the end of the rod is a simple uninsulated surface that, applied to the device along on either side of the tracks is contained in a small box with a hood-like cover. The device itself is a socket arrangement, into which the prong with the ends of uninsulated wire fit.

The moment that connection is established the usual method in use on ordinary telephone systems is followed. Instead, however, of calling up central, the communication is made with the dispatcher direct. The motorman announces the number of his train, his name and that of the conductor.

It is the rule that the conductor must be with the motorman when the call is given to the dispatcher. After the announcement is made to the dispatcher, he repeats it to the motorman. Orders are then transmitted, which the motorman communicates to the conductor verbally. Assurance is given by a repetition of the orders to the dispatcher. The car then proceeds or remains at the station as directed. Regular reporting stations are installed at which the train crews must report. The special stations are for emergency in case of wreck and unusual occurrences. Care has been taken in placing the points of communication close enough to ensure very little delay in case a car should break down between them, and the conductor be compelled to walk to the nearest one to notify the offices.

The reporting by telephone insures a manner in which the men reporting are personally directed. The telegraph multiplies the danger of error, in the fact that the orders are given through a second person to the train crews. With the telephone the directions are issued to the crew direct, and repeated to insure against mistakes.

PROSPEROUS WESTERN COMPANY.

The Southwestern Telephone Company (Independent), whose general office is in Anthony, Kansas, is evidently in a prosperous condition. A new exchange has just been built at Enid, Oklahoma, costing over $60,000, and the company is now rebuilding its exchange at Anthony. The Southwestern company owns seven exchanges in Kansas and Oklahoma, as follows: Anthony, Kansas, 300 subscribers; Harper, Kansas, 150 subscribers; Attica, Kansas, 50 subscribers; Carmen, Oklahoma, 125 subscribers; Cherokee, Oklahoma, 100 subscribers; Alva, Oklahoma, 250 subscribers, and Enid, Oklahoma, 800 subscribers. This makes a total of 1,775 subscribers now connected to the system. In addition, the company owns and operates 350 miles of toll lines which connect with all the Independent companies in Southwestern Kansas and Northwestern Oklahoma. The gross annual income of the company is over $50,000, dividends having always been paid during the eight years of its existence. P. G. Walton is president of the company, F. R. Zacharias, vice-president, and Fred Washbon, secretary and treasurer.

The Telephone in Court Circles

Judge Chester in the Hillside (Mich.) Circuit court has decided that private telephone lines cannot be maintained. Z. G. Culver desired to construct a private telephone line from his home to that of his daughter, a mile away, and for that purpose he made a contract with the Reading Telephone Company granting him the use of its poles so far as it controlled them. He then petitioned the council for permission to erect additional poles and string wire, which petition was denied, but he constructed the line in spite of this action. Under the direction of the council Marshal Davis cut the poles and wires. Then Mr. Culver brought this suit, asking the court to restrain the village from interfering with the construction and maintenance of said private telephone line. Judge Chester held that it is not the intention or policy of the law to say that every citizen in a village, if he chooses, shall have the right to maintain and operate a private telephone from his house to that of his friend in any other part of the village or elsewhere. Such a privilege granted would give rise to innumerable controversies and inconveniences to the citizens and their property rights, as well as to the village authorities in properly managing and maintaining their public streets and alleys.

F. M. Mossman of Whitely county, Indiana, is defendant in a very peculiar case. He protested against the erection of a telephone line in front of his home. He began by ordering the men who came to dig the post holes to leave the place. They dug the holes and he as quickly filled them in. The next gang of men succeeded in erecting the poles; these he pulled up and carried into his barnyard. They were replaced, and he next sawed them down; then he took an ax and cut the wires into short bits and split the poles. The president of the Whitely Telephone Company called upon him and told him that if he would refrain from molesting their property no prosecution would follow. Mossman declared: "As long as God gives me strength I will cut down the poles as fast as they are erected." He was arrested, fined $5 and costs, and given thirty days in jail, from which decision he took an appeal.

A legal fight is on at Dubuque, Iowa, to decide whether the United States Telephone Company, formerly the Cedar Valley, shall be controlled by F. F. McIlhinney and Thomas Cascaden, Jr., or by the small stockholders, who still claim the property, despite the fact that the bonds of the company were recently disposed of in Chicago to a third party, who, it is now claimed, was an agent for McIlhenney and Cascaden. The latter have started foreclosure proceedings at Dubuque, which the stockholders will fight to a finish. It is stated that the stockholders in the Cedar Valley and County Telephone and Telegraph companies have liens on the United States Company and propose to see that they are not frozen out. The bonds of the company, $100,000, were sold to the highest bidder for $20,000, and the stockholders declare this was a move on the part of the purchasers to get control of the system.

Fred M. Essig of Springfield, Ohio, administrator of the estate of Bertha Essig, has filed two suits for damages against the Springfield-Xenia Telephone company. One suit is for $10,000 damages and the other for $5,000. The former is for the benefit of the woman's heirs and the latter for the damages she sustained from the time of the accident until her death. Mrs. Essig, the petition alleges, while returning home on the night of April 2, 1904, stepped into a hole in the street made by the defendants and sustained internal injuries. She lived until June 18 and the second petition alleges that her death was the result of the injuries received by falling into the hole. The petitions further allege that the company was negligent in the construction of the work and that the accident was caused solely by its negligence.

The Boone County (Iowa) Telephone Company has commenced an injunction suit in the District court to restrain the Farmers' Mutual Telephone Company from severing its connections with that company. The Boone company states in its petition for injunction that it entered into a contract with the Farmers' Mutual to connect services for a period of three years. Now the plaintiff company says the Farmers' Mutual is threatening to sever its lines and thus deprive the patrons of the plaintiff company from talking to patrons of the defendant company. Because of the contract the plaintiff company says it has taken no steps to enter the territory of the defendant. It asks that the injunction, upon final hearing, be made permanent, and that the company be compelled to fulfill its contract.

By a vote of nine to three the jury in the $10,000 damage suit of Clara M. Smith of Woodland, California, against the Capital Telephone and Telegraph Company of Sacramento returned a verdict for the defendant. The plaintiff moved for a new trial and, in the event of denial, will appeal to the Supreme court. Clara Smith seeks to recover for permanent injuries sustained in an accident at Washington, Yolo county, several months ago. The horse she was driving became frightened at a passing train and the buggy collided with one of the company's poles. Testimony was introduced showing that the pole was placed in the public highway almost in the direct path of traffic.

The Supreme court of Illinois has affirmed the finding of the lower courts in the case of Charles Hiller of Joliet against the Chicago Telephone Company. This gives young Hiller damages to the amount of $2,500. The accident happened about six years ago, one morning when the two Hiller boys were on their way to school. A wire was down and one of the boys got hold of the live end. His brother tried to help him and also got a shock that injured him badly. The Chicago Telephone Company and the Economy Light and Power Company were joint defendants in the case. The jury allowed $5,000 when it reported, but the court reduced it to $2,500.

Circuit Judge Shaw, at Cincinnati, dismissed the petition of H. W. Haglage for a permanent injunction restraining the Citizens' Telephone Company from erecting a pole in front of his residence. In his decision Judge Shaw held that "under the ordinance of the city the company has the right to construct its system reasonably after its own plans, and, unless there is an abuse of the privilege granted by its franchise, a court cannot intervene by injunction." A temporary restraining order was granted on Mr. Haglage's petition last summer, but under the judgment rendered the former order is dissolved. The case will be taken to the Court of Appeals.

The jury in the case of the National Conduit and Cable Company vs. the Waterloo, Cedar Falls & Northern railway company, tried at Waterloo, Iowa, brought in a verdict for

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$1,325 for the plaintiff. This is a case wherein the plaintiff was endeavoring to collect $2,008.02, as the price of copper cable wire used for trolley wire between Denver and Denver Junction, a distance of three miles. The defendant railway company brought in a counter claim of $2,400 for damages alleged to have been due for the inconvenience that the wire, which was alleged to be unserviceable, caused them. The case was hotly contested throughout. It will be appealed to the higher courts.

At Canandaigua, New York, at the conclusion of a two days' examination before Justice E. H. Frary, Frank A. Jones, a prominent business man of East Bloomfield, and Constable Austin Allen were held to the grand jury in an action brought by the Empire State Telephone and Telegraph Company, charging the defendants with leveling a telephone pole in front of Mr. Jones' property. It is the opinion that if the case ever gets beyond the grand jury it will be made a test case, which will ultimately decide whether or not a telephone company can erect a pole on private property without the consent of the owner.

A damage suit has been filed in the Circuit court at Springfield, Illinois, by the Kinloch Long-Distance Telephone Company of St. Louis against Cecilia A. Scanlon. The plaintiff seeks to recover $750 for alleged damages to its line. It is hinted that criminal proceedings are to follow. The company alleges that it secured a permit from J. J. Scanlon. After the company had constructed the line the poles were chopped down, Mrs. Scanlon claiming the property. The cost of constructing the line amounted to more than $500.

Another point in the fight of the Illinois Manufacturers' Association against the Chicago Telephone Company has been decided adversely to the latter in the Circuit court. Judge Tuley at Chicago refused a motion of the defendant to force the association to increase its bond of $10,000, filed in court as an indemnity against loss to the telephone company. Allegations were made by the company that many of the 1,100 complainants in the suit to lower telephone charges are irresponsible financially.

Theresa McGuire of St. Paul has brought suit against the Northwestern Telephone Company for $10,000 damages for injuries done by a severe electric shock received while using one of the company's telephones. She alleges that last May while using one of the Northwestern telephones she received a shock which severely burned her arms and face. As the company is blamed for the existence of faulty wiring she considers that it is responsible for the amount named in the suit.

In the case of the Newark (Ohio) Telephone Company vs. Mrs. Jane Green, the plaintiff company contended that it had put in a telephone at her request, for which she had not paid. Defendant pleaded that she had notified the company to take the instrument out, which said company did not do. Defendant testified that she had used the telephone after serving notice on the company to remove it, and the court held that for this time she was bound by an implied contract to pay.

Thomas W. James of Salt Lake City has filed suit against the Utah Independent Telephone Company to have a nuisance abated from in front of plaintiff's premises and to recover $150 damages to his property alleged to have been caused by such nuisance. It is alleged that defendant has placed a large pole in front of plaintiff's premises from which large cables are stretched to anchor another one of its poles. It is claimed that the pole and wires obstruct the entrance to plaintiff's premises from the street, and hence he asks that the defendant be compelled to remove them.

The Nebraska Telephone Company was defeated in its suit in the district court at Grand Island, Nebraska, appealing from the assessments in that city and county, made under the new law. The court, Judge Hanna presiding, overruled its contentions and the company, which under the old law was assessed at about $2,500 in Grand Island, and under the new law at $9,000 this year, will have to more nearly pay its just proportion of the taxation.

The damage case of Charles Keeler against the Fremont (Neb.) Telephone Company will be tried again in the Dodge county district court. Keeler was injured while working on a telephone pole belonging to the company. He sued for damages and was given a judgment for $150 by the lower court. The Supreme court declared that the telephone company was not guilty of contributory negligence and reversed the decision of the lower court.

In the action brought against the Missouri & Kansas Telephone Company by the city of Kansas City to force it to accept the rates for telephone service as indicated by the ordinance, by agreement the Supreme court of the state continued the hearing to the April sitting. The court decided once that the city could not make rates for the company, and on motion of the city reopened the suit for the receiving of new arguments.

Mrs. Sarah Wiseman of Muncie, Indiana, is preparing to bring suit against the Central Union Telephone Company and the city of Muncie, jointly, unless she is recompensed for certain injuries she alleges to have received. It is claimed by Mrs. Wiseman that she tripped over a rope which had been stretched across a sidewalk by the telephone company; that she was severely injured, and has practically lost the use of her left arm.

The proceedings started at Green Bay, Wisconsin, recently against officers of the Valley Telephone and Telegraph Company and certain members of the city council have been stopped by an injunction granted by Judge Hastings. The proceedings were to perpetuate the testimony of the defendants on the charge that undue influence was used in securing the franchise recently granted to the company.

In the suit of James Farmer, of Meridian, Mississippi, against the Cumberland Telephone and Telegraph Company for $10,000 damages, a motion by defense that the court give peremptory instructions to the jury to find for the defendant was sustained. The case will be appealed. The plaintiff had a knee cap broken by the kick of a horse belonging to the defendant company and while in its service.

The suit of John Brown against the American Telephone & Telegraph Company was recently tried at Canandaigua, New York. Brown of Victor sued for the removal of sixteen poles from his farm. This is one of the six ejectment suits brought by Attorney Jay W. Smith of Rochester, as attorney for the plaintiff. The jury was out only ten minutes, and found for the defendant.

The injunction case of the Northwestern Telephone Company against the Tri-State Telephone Company was argued before Judge Brooks at Minneapolis recently, but no decision was rendered. The suit was brought to prevent the Tri-State company from putting up poles and stringing

wires along the Northwestern company's line from Minneapolis to Willmar.

Alleging that the ordinance providing for a tax of $1 on every telephone pole and ten cents additional for each crossbar is unconstitutional and discriminating, the Wisconsin Telephone Company has brought suit against the city of Milwaukee to have the ordinance nullified. The telephone company has 6,900 poles in that city.

By decree of chancery court the Huntsville, Guntersville & Gadsden telephone line in Georgia has been sold at public auction and was bought in by Lawrence Cooper for the creditors of the plant. The line will be merged with that of the Hope & Gurley telephone system and extensive improvements will be made.

Florence Warren and sisters of Austin, Texas, recently filed suit in the district court against the Southwestern Telegraph and Telephone Company and the city of Austin for $25,000 damages for the death of their father, who was killed some time ago by coming in contact with live wires of the defendants.

A case was tried by telephone in Salem county, New Jersey, when William Perrine was arrested by a game warden for shooting a bird protected by law. Justice Harris Smith called Perrine up by telephone, and Perrine entered his plea immediately. The justice then fined Perrine $26 over the telephone.

The fight which has been on between the Central Union Telephone Company and the city of Wooster, Ohio, since 1901 has reached the Supreme court, the city bringing the case up on error. The granting of a franchise for the use of the streets of Wooster was blocked by the city council.

Suit has been brought in the Federal court against the United States Telephone Company, of Waterloo, Iowa, to determine the priority of several issues of bonds, and it is thought that after the present litigation is over, the public will be taken care of more satisfactorily.

T. C. Albritton, of Louisville, Kentucky, has filed a suit in the Fayette county (Ky.) court against the American Bell Telephone Company to recover five years' back taxes alleged to be due on $50,000 worth of property in that county.

Circuit Clerk H. C. Allin of Harrodsburg, Kentucky, has sued the East Telephone Company for $1,000 damages. He alleges that prior to moving to his farm the company agreed to put a telephone in his country place, but failed to do so.

Timothy O'Halloran, at Seattle, Washington, has begun suit against the Sunset Telephone Company for $10,000 damages for injuries alleged to have been sustained by a log falling from a wagon belonging to the telephone company

The Northwestern Telephone Company must pay Philip Barden of St. Paul $500 for injuries received by Barden in being shocked by a defective telephone receiver. Judge Jaggard has denied defendant's motion for a new trial.

William Damon, guardian of J. H. Damon, of Warren, Ohio, has filed a suit against the Warren and Niles Telephone Company for $3,000 damages sustained by coming in contact with the company's wires.

The Supreme court of Nebraska has denied a rehearing of the Nebraska Telephone Company vs. the city of Fremont, involving the company's franchise. This finally disposes of it, in the company's favor.

Walter Long of Iowa City, Iowa, has commenced suit against the Johnson County Telephone Company for $6,000 damages for injuries sustained February 27, 1904, while in the employ of the company.

EVIDENCE BY TELEPHONE

A notable incident of an otherwise uninteresting murder trial which recently took place in New York followed an attempt by the prosecuting attorney to utilize a means of communication that is considered, outside of court rooms, perfectly satisfactory for almost every purpose, including many of the greatest importance. The prisoner had testified that he had owned the revolver with which he did the killing—in self-defense, he asserted—since 1901, while the prosecution, having noted the number on the weapon, had learned from its manufacturers that it was made in 1903. This information, with its obvious bearing on the prisoner's credibility, and, in a lesser degree, on the question of premeditation, had been obtained by long-distance telephone during a recess of the court, and the prosecutor naturally wanted to get it before the jurymen. He therefore proposed the immediate installation of a telephone in the court room, in order that the jury might hear a repetition of his inquiries about the pistol and the manufacturers' replies. This plan was in complete accord with the habitual conduct of business affairs at the present time, and its convenience and economy would have recommended it to any layman desirous merely of ascertaining a needed fact, quickly and correctly. Telephones, however, were invented some years since the rules of procedure in murder trials were established, and no sooner had the suggestion been made than the prisoner's counsel leaped to his feet with a vehement objection, based on the fine old principle that it is a defendant's constitutional right to be confronted by the witnesses against him. Of course the judge held that the objection was well taken and the telephoning plan had to be abandoned.

TO TELEPHONE AROUND THE WORLD.

That it will be possible to telephone around the world in a few years, and that wireless telegraphy will be a thing of everyday use, is the opinion of Doctor T. Crossing White, an eminent scientist of Boston. This will be made possible by the amplifier, a new electrical device which has recently been invented.

"The amplifier," said Doctor White, "is the invention of Stephen Dudley Field. By means of it, terrestrial space is annihilated, as far as the sending of electrical vibrations is concerned. The amplifier is simply a mechanical microscope. It reads and records all variations in intensity, and though the current be so attenuated that we can read the signals no other way, the amplifier will easily record them. The amplifier, with its system of coils and magnets trussed on threads one-thousandth of an inch in size, works as well with one one-hundredth-thousandth of an ampere as with a one-thousandth ampere. By means of an amplifier messages have been sent through a resistance coil so strong as to take two seconds to transmit the signals at the rate of thirty words a minute. The Atlantic cable causes an intermission of a second, and the highest speed it has is from sixteen to seventeen words a minute.

"By means of the amplifier a message may be sent all around the world without repeating or intermission. By means of the amplifier wireless messages have been received on paper. There is no doubt but that when the machine is improved we will be able to even talk around the world."

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Municipal Police Patrol Systems

THE department of commerce and labor, bureau of the census, of which S. N. D. North is director, has recently sent out a bulletin on the application of the electric telegraph and telephone to the fire alarm and police patrol systems of the United States, prepared under the direction of W. M. Steuart, chief statistician for manufactures. These statistics have been compiled in accordance with the provisions of Section 7 of the act of congress of March 6, 1902. This bulletin is the third of a series of reports on the generation and utilization of electric current compiled and distributed by the government. In this article only the report on the police patrol systems will be touched upon.

The schedules for this report were collected entirely by correspondence, and the bureau is to be congratulated upon the prompt attention given by the city officials to its requests for information. Complete reports were received for all cities in which the systems were known to be in existence, with the exception of a few unimportant towns, in some of which the commercial telephone companies were utilized by the fire alarm and police patrol systems, there being no system operated for the exclusive benefit of the municipality. The statistics were compiled by the regular clerical force of the bureau, and the text prepared by Thomas Commerford Martin of New York city, expert special agent.

The schedules of inquiry used in this investigation were designed to secure information concerning the construction and equipment of the two systems and the amount of service rendered during the year ending December 31, 1902; also the number of persons employed exclusively in the management, care, or operation of the electrical department of the systems, and their salaries and wages. It was found, however, that as a rule the employes engaged in operating the fire alarm and police patrol systems were also employed in connection with other features of the service.

No previous inquiry of the kind has been made in the United States serving as a basis of comparison, and the present inquiry was restricted to systems depending upon the application of the electric telegraph and telephone. The data here presented refers exclusively to systems operated under municipal control.

TABLE No. 1.—*Electric police patrol systems, grouped according to boards or departments of administration: 1902.*

Boards or Departments of Administration.	Systems.
Administrative bodies	49
Board of police commissioners (or commissioner)	27
Board of police and fire commissioners	6
Board of public safety (or director, or commissioner of)	14
Board of public works (or commissioner of)	4
Board of trustees	1
Department of electricity (or city electrician)	7
Department of fire and police patrol telegraphs	2
Department of police and city property	1
Department of wire inspection	1
Fire commissioner and city council	1
Mayor	1
Mayor and board of police commissioners	1
Mayor and chief of police	1
Mayor and city council	3
Mayor and city marshal	1
Police department (or police)	24
Special committee by vote of town	1
Superintendent of police and board of public safety	1
Not reported	2
Total	148

Reports were received from 148 electric police patrol systems. Table No. 1 shows the boards or departments of administration to which the several police patrol systems are subject. From this table it will be seen that forty-nine systems, or about one-third of the total number reported in 1902, were governed by administrative bodies—boards of aldermen, boards of selectmen, city councils, etc.—twenty-seven by boards of police commissioners, twenty-four by police departments and fourteen by boards of public safety. While electric fire alarm systems were installed and operated as early as 1852, work upon police patrol systems was of a very uncertain and indifferent character up to the year 1881. Table No. 2 shows the number of police patrol systems installed during each year from 1867 to 1902, inclusive.

TABLE No. 2.—*Electric police patrol systems installed each year.*

Year.	Number.	Year.	Number.
1902	8	1883	3
1901	6	1882	1
1900	8	1881	1
1899	7	1880	1
1898	8	1879	1
1897	5	1878	1
1896	8	1877	—
1895	7	1876	1
1894	9	1875	—
1893	11	1874	1
1892	7	1873	—
1891	10	1872	—
1890	13	1871	—
1889	4	1870	1
1888	3	1869	—
1887	6	1868	—
1886	7	1867	1
1885	3		
1884	6	Total	148

It will be seen from this above table that only eight systems had been installed prior to 1882. From that year onward, however, a marked increase was seen. The decade 1882 to 1892 witnessed the installation of fifty-six plants; the decade 1892 to 1902 was even more active, seventy-six plants being installed during the period, while during the eleven years from 1892 to 1902, inclusive, there were in all eighty-four installations. The increase in the introduction of electric police patrol systems has hardly kept pace with the adoption of fire alarm systems, however, the number of fire alarm systems being in 1902 more than five times as great as the number of police patrol systems, in spite of the fact that the two can be and are so frequently operated in co-operation, or under the same management.

Table No. 3 presents the general statistics with regard to the construction and equipment of the service and the amount of work done, together with the percentage which each item is of the total.

The 148 systems reported were distributed as follows: Thirty-four in cities of 100,000 population and over, thirty in cities of 50,000 and under 100,000, thirty-nine in cities of 25,000 and under 50,000, thirty-three in cities of 10,000 and under 25,000, and twelve in cities and towns of less than 10,000. These 148 plants had an overhead wire mileage of 17,339 miles, comprising 14,296 miles of single wire and 3,043 miles of single wire in cables, and occupying 3,187 miles of leased pole line and 829 miles of pole line owned by the respective departments. In addition to the overhead construction there were 9,011 miles of wire in underground construction, of which 264 miles were single wire and 8,747 miles single wire in cables. This wire and cable occupied 502 miles of leased conduit and 271 miles of conduit owned

by the departments. The circuits thus enumerated were occupied by 9,476 signaling boxes, of which 6,747 were on poles or posts and 2,729 otherwise disposed. There were also 1,170 telephone boxes, of which 1,060 were on poles or posts, leaving 110 in booths, buildings, etc. The number of special telephones used by the departments was 1,998. Over all these instruments 40,626,505 police calls were received or sent, of which 23,393,812 were telephonic and 17,232,693 were of signaling and all other kinds.

or one box to every two and a half miles of circuit. For these 10,646 boxes, the total number of messages sent and received was 40,626,505, giving an average, per box or station, of 3,816 messages during the year, or a daily average use of more than ten calls. This would appear to be a very extensive use of the systems, and will give some idea of their value and service as a means of increasing the efficiency of the police department and of furnishing aid at times of emergency.

TABLE No. 3.—ELECTRIC POLICE PATROL SYSTEMS, GROUPED ACCORDING TO POPULATION OF CITIES, AND PERCENTAGE EACH ITEM IS OF TOTAL: 1902.

	POPULATION GROUPS						PER CENT OF TOTAL				
	Total	100,000 and over	50,000 and under 100,000	25,000 and under 50,000	10,000 and under 25,000	Under 10,000	100,000 and over	50,000 and under 100,000	25,000 and under 50,000	10,000 and under 25,000	Under 10,000
Number of systems	148	34	30	39	33	12	23.0	20.3	26.3	22.3	8.1
Overhead construction:											
Miles of pole line—											
Owned	829	582	101	95	42	9	70.2	12.2	11.4	5.1	1.1
Leased	3,187	1,589	537	613	302	146	49.9	16.8	19.2	9.5	4.6
Wire mileage—											
Total	17,339	13,552	1,828	1,197	578	184	78.2	10.5	6.9		1.1
Single wire	14,296	10,654	1,767	1,149	542	184	74.5	12.4	8.0	3.3	1 3
Single wire in cables	3,043	2,898	61	48	36	.....	95.2	2.0	1.6	3.8	.....
Underground construction:										1.2	
Street miles of conduit—											
Owned	271	239	19	1	12	.....	88.2	7.0	0.4		.....
Leased	502	425	31	18	28	.....	84.6	6.2	3.6	4.4	.....
Wire mileage—										5.6	
Total	9,011	8,646	178	69	118	.....	95.9	2.0	0.8	1.3	.....
Single wire	264	172	58	6	28	.....	65.1	22.0	2.3	10.6	.....
Single wire in cables	8,747	8,474	120	63	90	.....	96.9	1.4	0.7	1.0	.....
Number and character of boxes or signaling stations:										5.2	
Signaling	9,476	6,496	1,330	873	497	280	68.6	14.0	9.2	5.9	3.0
Number on poles or posts	6,747	4,317	1,127	772	399	232	62.5	16.7	11.5	3.6	3.4
All other	2,729	2,279	203	101	98	48	83.5	7.4	3.7	13.2	1.8
Telephoning	1,170	798	95	115	154	8	68.2	8.1	9.8	12.1	0.7
Number on poles or posts	1,060	753	94	78	128	7	71.0	8.9	7.3	23.6	0.7
All other	110	45	1	37	26	1	40.9	0.9	33.7	0.8	0.9
Special telephones	1,998	1,668	197	112	17	4	83.5	9.9	5.6	3.1	0.2
Police calls received or sent	40,626,505	31,558,693	5,150,225	2,301,511	1,252,408	363,668	77.7	12.7	5.6	4.0	0.9
Telephone	23,393,812	20,430,896	1,439,191	404,791	925,731	193,203	87.3	6.2	1.7	1.9	0.8
All other	17,232,693	11,127,797	3,711,034	1,896,720	326,677	170,465	64.6	21.5	11.0		1.0
Central office equipment:										9.6	
Manual transmitters	83	40	14	19	8	2	48.2	6.9	22.9	6 7	2.4
Automatic transmitters	30	10	7	9	2	2	33.3	23.3	30.0	4.8	6.7
Receiving registers, all kinds	439	311	51	49	21	7	70.8	11.6	11.2	7.1	1.6
Receiving circuits	1,272	826	138	195	90	23	64.9	10.9	15.3	9 0	1.8
Transmitting circuits	983	577	138	166	88	14	58.7	14.0	16.9	5.7	1.4
Telegraph switchboards, number	70	42	12	10	4	2	60.0	17.1	14.3	10.7	2.9
Number of sections	84	49	13	11	9	3	58.3	14.3	13.1	2.4	3.6
Total capacity	578	433	64	59	14	8	74.9	11.1	10.2	5.9	1.4
Telephone switchboards, number	187	142	13	20	11	1	75.9	7.0	10.7	6.7	0.5
Number of sections	224	158	17	33	15	1	70.5	7.6	14.7	9.3	0.5
Total capacity	3,055	2,370	195	201	286	3	77.6	6.4	6.6	39.3	0.1
Single circuits	28	3	3	5	11	6	10.7	10.7	17.9		21.4
Central station power equipment:											
Motor generators and dynamotors—											
Number	18	8	7	2	1	.....	44.4	38.9	11.1	5.6	.....
Horsepower	18	8	2	7	1	.....	44.4	11.1	38.9	5.6	.....
Battery cells—											
Primary	24,477	19,785	1,907	1,178	1,147	460	80.8	7.8	4.8	4.7	1.9
Storage	11,317	4,823	3,439	2,239	742	74	42.6	30.4	19.8	6.6	0.6

The central office equipment of these 148 systems comprised eighty-three manual transmitters; thirty automatic transmitters; 439 receiving registers; 1,272 receiving circuits; 983 transmitting circuits, seventy telegraph switchboards, with a total capacity of 578 lines; 187 telephone switchboards in 224 sections, with a total capacity of 3,055 drops or circuits; and twenty-eight single circuits.

The central station power equipment for the operation of this apparatus included 24,477 cells of primary battery, 11,317 cells of storage battery, and eighteen motor generators and dynamotors, with a total capacity of eighteen horsepower. The underground construction is practically confined to the larger cities, none of it being found in cities of less than 10,000 population, and only 365 miles out of a total of 9,011 miles of circuit, in cities of less than 100,000 population. The bulk of the signaling apparatus, as of the circuits, whether overhead or underground, is also concentrated in the larger cities, 6,496 signaling boxes, or 68.6 per cent of the total number, being found in cities of a population of 100,000 and over, while of the telephone boxes 198, or 68.2 per cent, were found in cities of the same population group. The work done by the service followed practically the same proportions, 77.7 per cent of the total calls received or sent being limited to the cities in the highest population group. The 10,646 signaling and telephoning boxes reported were distributed over 26,350 miles of circuit,

It is noticeable that the use of the telephone predominated, the number of telephonic messages being 23,393,812, as compared with 17,232,693 of all other kinds. The difference between the fire alarm and police patrol systems is here sharply indicated. In the case of the former, when a fire breaks out, the chief object is to notify headquarters and near-by engine houses, etc., of the exact location of the fire, which can best be done by having each box preadjusted to transmit a definite signal. On the contrary, in police administration, the occasions which arise for the use of the telephone, aside from locating an officer on his beat, are of a most varied character, requiring, both in transmitting messages to headquarters and in receiving them upon a beat, the giving of a number of specific details, which could not be conveyed by prearranged signals. The inference with regard to the telephonic service is not correct, however, if based upon the number of telephoning boxes only, as it would appear that the 1,998 special telephones should be considered. If, therefore, the number of special telephones be added to the number of telephoning boxes or stations, it would appear that the 3,168 telephones are to be credited each with 7,384 calls sent or received, or about four times as many as the signaling boxes, a striking demonstration of the prominent part played by the telephone in the police patrol system.

The variations in the service are further illustrated by a

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study of the percentages shown in Table No. 3. The systems were well distributed, twenty-three per cent being in cities of 100,000 population and over, 20.3 per cent in cities of 50,000 and under 100,000, 26.3 per cent in cities of 25,000 and under 50,000, 22.3 per cent in cities of 10,000 and under 25,000, and 8.1 per cent in cities and towns of less than 10,000. The table brings out very clearly the fact that cities of 100,000 population and over reported a large proportion of the equipment; and that, extensive as the use of the police signal box and telephone has been shown to be, they are still limited to the larger cities; 68.6 per cent and 68.2 per cent, respectively, of the total number of such boxes were located in cities of 100,000 population and over, while the corresponding percentages for cities in the smallest population group are three and 0.7, respectively. Moreover, cities of 100,000 population and over received and sent 77.7 per cent of all police calls, and no less than 87.3 per cent of all telephone messages. Thus there appears to be a large field for the introduction of telephones for police service in the smaller communities, where they would be most useful, the number of officers being few and the population and dwellings being sparsely scattered over a large area.

Table 4 may be studied in conjunction with Table 3, as showing the number of police patrol systems reporting the different items of construction and equipment, grouped according to the population of cities.

Of the 148 systems considered fifty-seven used both overhead and underground wires; of these, twenty-eight were in the first population group, eleven in the second, and ten in the third, or a total of 49 in cities of 25,000 population and over. There were 125 systems which reported signaling boxes only, nineteen which reported telephoning boxes only, and three which reported both signaling and telephoning boxes. Of the 112 systems using both receiving and transmitting circuits, twenty-eight were in the first population group, twenty-five in the second, and thirty-three in the third; and of the twelve systems reporting the use of both manual and automatic transmitters, eleven were in the first three groups. With regard to the power plant, it is interesting to note that ninety-four plants reported the use of primary batteries, and seventy-four reported their dependence upon storage batteries; a much larger proportion for the latter than could possibly have been expected. Although, as already noted, only nineteen systems reported the use of telephoning boxes exclusively, and three the combined use of signaling and telephoning boxes, fifty-six reported the use of telephone switchboards. It would appear upon the face of it, that such figures must involve discrepancies, but in many of the systems in large cities the boxes are of a combination signal and telephone type, and were reported as signaling boxes only, thus vitiating to a great extent a comparison between the number of telephone boxes and the telephone calls shown in the tables. This fact accounts also for reports of telephone messages or switchboards in cases where there are no returns of telephoning boxes or special telephones.

The 148 police patrol systems were distributed in thirty-two states and the District of Columbia. Massachusetts is credited with the largest number, twenty-eight; New York comes next with fourteen, but in the latter case it should be noted that New York city, which has four separate systems, is counted as only one system. Illinois has twelve systems; Ohio and Pennsylvania, each eleven; New Jersey, eight; and Connecticut and Wisconsin, each six. It appears from the table that the number of police calls sent or received by telephone was 6,901,355 in Pennsylvania, and 4,224,866 in Illinois, the state next in rank. The large proportion in Illinois is due to the extensive use of the telephone in the city of Chicago. In 1902 New York had 938 signaling and forty-seven telephoning boxes, and 279 special telephones, with which 5,360,137 calls or messages of all kinds were sent or received; but, as noted elsewhere, since the time of this report the borough of Manhattan has contracted for no fewer than 661 police patrol stations, to be operated in conjunction with the local telephone system. It is to be noted, in fact, that the number of special telephones reported in 1902 was considerably larger than the number of telephoning boxes specifically described as such, but it has already been explained that a considerable number of systems reporting signaling boxes used a combination system of signaling and telephoning.

TABLE NO 4.—*Electric police patrol systems reporting different varieties of construction and equipment, grouped according to population of cities: 1902.*

CHARACTER OF CONSTRUCTION AND EQUIPMENT	NUMBER OF SYSTEMS, BY POPULATION GROUPS					
	Total	100,000 and over	50,000 and under 100,000	25,000 and under 50,000	10,000 and under 25,000	Under 10,000
Overhead construction:						
Pole line—						
Owned exclusively	14	4	2	4	3	1
Leased exclusively	105	20	19	30	26	10
Owned and leased	29	10	9	5	4	1
Overhead construction exclusively	91	6	19	29	25	12
Underground construction:						
Conduit—						
Owned exclusively	13	5	5	1	2	.....
Leased exclusively	35	14	6	9	6	.....
Owned and leased	9	9	.....	.....	.....	.....
Both overhead and underground construction	57	28	11	10	8	.....
Boxes or signaling stations:						
Signaling boxes exclusively	125	28	28	34	24	11
Telephone boxes exclusively	19	4	2	4	8	1
Both signaling and telephone boxes	3	1	.....	1	1	.....
Special telephones	56	22	11	16	5	2
Central office equipment:						
Manual transmitters exclusively	36	9	6	12	8	1
Automatic transmitters exclusively	13	1	3	6	2	1
Both manual and automatic transmitters	12	4	4	3	.....	1
Receiving registers, all kinds	115	30	26	34	19	6
Receiving circuits	120	32	27	34	21	6
Transmitting circuits	112	28	25	33	21	5
Both receiving and transmitting circuits	112	28	25	33	21	5
Telegraph switchboards exclusively	24	3	9	6	4	2
Telephone switchboards exclusively	56	17	9	18	11	1
Both telegraph and telephone switchboards	14	9	3	2	.....	.....
Single circuits exclusively	28	3	3	5	11	6
Central station power equipm't:						
Motor generators and dynamotors	11	7	1	2	1	.....
Battery cells—						
Primary	94	22	19	20	24	9
Storage	74	18	20	23	11	2
Both primary and storage	24	6	9	5	3	1

[1]One system reported only telegraphing boxes, which are not shown in this table.

Most of the police patrol systems are located in those states having the greatest number of large cities; but it is probable that the extension of the telephone throughout the rural districts has made greater progress than appears from the figures here presented, for it is a matter of record that the use of the farmers' telephones in rural districts has greatly lessened the labor of sheriffs and constables in connection with suppressing the "tramp nuisance."

HISTORICAL AND DESCRIPTIVE.

The utilization of the telegraph as an aid in the detection and suppression of crime, and also in connection with other duties falling to the protectors of the peace, was quite early resorted to by the police departments in various large cities. In fact, one of the very earliest instances of the use of the telegraph in England—and that which did most to direct public attention to it at that time—was the forwarding from one city to another of a telegram describing an escaped murderer, who was promptly arrested by means of the assistance thus given. In the leading American cities the practice early took root of employing telegraph operators at headquarters, as members of the force, to transmit messages and receive signals over wires connected with the police stations in the various precincts. In 1858 the firm

of Charles T. & J. N. Chester made for the New York city police department a dial telegraph, which soon afterwards was adopted also by Philadelphia.

It is obvious, however, that this practice, if based simply upon Morse telegraphy with the use of the key and sounder, or even with the aid of the Morse register, would involve an undue and expensive staff of operators, and these conditions could not be greatly improved even by the use of the dial system, wherein the operation of an electrical apparatus with a keyboard something like that of a typewriter enables a message to be sent directly in letters of the alphabet, thus avoiding the necessity of first translating them into dots and dashes and then having them translated back again. In the case of fire alarm telegraphs, a mere notification by numerals suffices to give the required alarm and bring prompt assistance; but in the case of police patrols, the facts transmitted in each case are so varied in character as to require specific details, and even the brief delay of putting a message into the Morse code or into a cipher would consume too much time.

Under these circumstances it was natural that resort should be had to the telephone; and the evidence goes to show that the combination of the telegraph and telephone as an auxiliary to the police force was first introduced in 1880 in the city of Chicago by J. P. Barrett, then superintendent of the electrical department of that city. The system was first installed in one of the most turbulent districts of the city, and at once increased tremendously the efficiency of the force, chiefly in the way of making possible a rapid concentration at any troubled point. Its success was so rapid that by 1893 no fewer than 1,000 street stations had been installed all over the city of Chicago, and in addition several hundred private boxes had also been put in, giving instant communication, at any hour of the day or night, with all the stations of every precinct. Since that time the idea has been carried even further in various ways, as the accompanying report shows, not only in Chicago, but in other cities. Milwaukee was the second city to adopt the police telephone booth, the installation being made in 1883. Brooklyn followed in February, 1884, with many improvements, which appear to have been made there for the first time. Upon the suggestion of Frank C. Mason, superintendent of the police telegraph bureau, iron boxes, similar to those employed in fire alarm telegraphy, were used instead of the unsightly booth. Philadelphia, however, adhered to the booth, introducing it in July, 1884; since that time the system has been extended year by year, and some of the more modern street boxes have been introduced.

As the work in Chicago is typical, and is the fundamental form from which the others have been evolved, a brief description of it may be given. A special feature was the adoption, for street stations, of an octagonal booth or inclosure about eight feet high and two feet four inches in diameter. For many reasons such sentry boxes are preferable to boxes on walls or lamp-posts, as the patrolman once within is secure from interruption while communicating with headquarters, and, moreover, the intelligence he wishes to convey can be kept secret—a matter of considerable importance on many occasions. Keys which will open any of the street stations and boxes are given to the patrolmen of the district, and are also placed in the hands of responsible citizens, the names of the citizens and the numbers of the keys being carefully recorded. The citizen's key only turns in a call for help, but the patrolman's key gives him access to the inner box, from which he can transmit calls, signals, and reports, by means of telephone receivers and transmitters and other apparatus.

The private boxes placed in residences, banks, hotels, etc., enable the persons using them to call up the police at any time by simply turning in an alarm; by pulling the lever or handle attached to the box, as in the case of the district messenger boxes, the nature of the trouble can be indicated roughly. At the police station is kept, under seal, a key of the house employing the signal box, so that upon arrival the police can immediately let themselves in and proceed to business. Each night, the renter of the alarm box can make a test of the system, an answering ring showing the line to be in working order; in the same way, after an alarm has been sent in, a return tap signal of the bell gives assurance that the call has been heard and will be attended to immediately.

Notwithstanding the advantage of being able to carry on a conversation by telephone, there is a certain advantage in automatic signaling, as there can be no variation, and no wrong idea can be conveyed by an excited dispatcher to a confused operator at central who cannot understand what is being said.

In addition to the telephone system and the automatic signals, visual signals were introduced. Semaphores were used by day and flash lights by night, by utilizing either ordinary lamp-posts or lamps placed on top of the booths; an additional feature was the ringing of a large bell. Not only are the visual signals used as a means of registering the proper circulation of patrolmen on their beats, but they have this advantage—they can be operated on all the boxes on any one circuit.

The systems of the present day are analagous to that which has just been outlined, the signal box being provided with a telephone, by means of which patrolmen can communicate with police headquarters. The telephone is supplemented, however, by other apparatus for signaling and telegraph purposes. For example, with one type of box the patrolman advises the central office of his being on duty by opening the box with a special key, thus transmitting the number of the box, which, with the time, is recorded automatically upon a slip of paper by an electric time stamp. These signals are transmitted at a higher rate than fire alarm signals, for the reason that no heavy apparatus, such as a gong, is used. These signals may be said to correspond in their nature to those of a watchman's automatic registering system, being received by the central office mechanically, without intervention of an operator. The mechanism of the box is so arranged that when a signal requiring immediate attention is sent in, a local circuit is closed by a bell magnet, thus calling special attention to the incoming signal. A further modification makes it possible in case an officer on the beat has requested the dispatch of a police wagon or ambulance, to convey or transfer the signal to the stables; in this event the call is transferred by the operator to the dial mechanism communicating with the stables, a lever is pulled, and the number of the box is sent over the circuit to the stables, where it is both struck by the gong and exhibited visually on an indicator.

As already stated, police patrol boxes are sometimes fitted with two keys, and the boxes ordinarily in use in the large cities are of this type. Such boxes usually have both an outer and an inner door, the object of the outer one being generally to limit the extent to which the private citizen can utilize the box. When the key has once been put in the "citizen" keyhole and turned, it cannot be withdrawn until the outer door has been opened, whereupon the signal is transmitted to headquarters. The patrolman on his rounds opens the doors, and, if he wishes merely to report his presence there, places the point of the small dial at the top of the plate inside at the "report" section, when an answering signal within the box will inform him that his report has been received at headquarters and that he may proceed on his rounds. Should it be desired by "central" to hold him for instructions, a definite number of strokes on the bell notifies him to use the telephone, which hangs in the inner box. This signal can be sent to any box, even in the absence of the central office attendant, thus obviating the pos-

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sibility of the policeman getting away before the special call can reach him.

Another form of box is fitted with the keyless door, which can be opened by any citizen desiring to use it, the turning of the handle sounding an alarm on a gong and thus notifying any policeman at another box on the same beat that it is in use. In some systems provision is made whereby the patrolman is unable to prevent the box from keeping automatically a faithful record of his movements; for instance, a policeman could not remain at one box and from there, at the proper time, send in false signals purporting to come from other boxes at different points on his beat. It is obvious that many other modifications and changes can be introduced, according to local requirements and conditions, but the features here outlined are those which are most generally used at the present time.

A remarkable proof of the enlarged scope given the service by the use of the facilities of the modern telephone exchange is afforded by the latest development of the telephonic police signal system recently put in operation in the city of New York. This system was determined upon early in 1903, after several conferences between Prof. G. F. Sever, consulting electrical engineer on behalf of the city, and the representatives of the New York Telephone Company, held at the office of Police Commissioner Greene. It was decided to install in the borough of Manhattan no fewer than 661 police telephone stations, from twenty to thirty in each of the twenty-nine police patrol precincts. After a careful and thorough investigation it was decided to eliminate from this system all signal appliances aside from the telephone itself, it being held that everything provided for in the ordinary combination signal and telephone box, and much more, could be done through the telephone station.

A station consists of a telephone transmitter and receiver and a call bell placed in a cast iron box securely fastened to the wall of a building; six of these telephone stations comprise one circuit. Each patrolman is provided with a key, and is required to report to the station house at a designated time in each hour; if he is delayed more than fifteen minutes a roundsman is detailed to investigate the reason for the omission of the call. It is held that there is no possibility whatever of turning in an improper report, as the operator at the central station, who knows all the men, can always recognize the voice of the patrolman, and can determine from the signal the box from which the call is made.

In the station house in each precinct there is installed a small switchboard operated by specially detailed patrolmen. The operator at this switchboard records the box and the time at which each patrolman reports, as well as all other messages in the nature of ambulance and patrol wagon calls, reports of riots, and other exceptional occurrences; he also telephones to police station stables for patrol wagons and to hospitals for ambulances.

One improvement which it is thought may be desirable is the abolition of the circuits having telephones in series groups of six, in favor of a system in which each instrument is on a separate metallic circuit, and is provided with two individual wires, as is generally the case in the modern telephone system in every large city. This arrangement would absolutely eliminate the possibility, if there is any, of collusion on the part of patrolmen with regard to reporting at the proper time but at a different box from that at which the call should be turned in.

All the work of installation, maintenance, and operation, outside of that of the operator at the switchboard, is looked after by the New York Telephone Company, the police department paying an annual rental for the use of the apparatus. This arrangement obviates the necessity for the maintenance by the police department of a corps of skilled men to maintain and operate such a signal system as would, under ordinary circumstances, be owned by the city; and it virtually places at the command of the police department all the resources of a modern telephone exchange with its engineering staff. It is impossible to make any estimate of the results obtainable with this system, which at the time of writing has been installed in but one precinct, and it still remains to be seen whether it is not better for the city to maintain its own apparatus and staff.

With regard to the subject of ambulance alarm circuits in hospitals and public institutions—a branch of the work still in a somewhat unorganized condition—it would appear that in New York city almost all ambulance calls are sent in from either public or private telephone stations; a patrolman sends the call to the central police headquarters in Mulberry street, whence it is transmitted to the hospital nearest the scene of accident or trouble. The city fire alarm circuits also are sometimes used for sending in ambulance calls to fire headquarters, whence they are transmitted by telephone either to the nearest hospital or to police headquarters, as, for example, when a fire chief, being near the scene of an accident, avails himself of the facilities of his department in securing prompt relief.

TELEPHONE WAR AT DALTON, GEORGIA.

A telephone conflict of no small proportions is in progress at Dalton, Georgia. Not long ago the local exchange promulgated an order refusing the use of telephones to non-subscribers, with some restriction, however. Considerable bitterness arose as a result. Quite recently the telephone company issued a new schedule of prices increasing the rate for business telephones.

Coming as it did on the heels of the former disagreement, a large number of the business men of that city held a meeting and ordered their telephones removed. As a result some sixty or more telephones were removed November 1, and the work is still in progress. The local exchange has been very successful and had a large list of subscribers. However, both sides seen determined to wage the war to the bitter end. Vigorous effort is being made by some of the business men to get others to remove their instruments.

It is alleged that boycotting is being resorted to by merchants to force all business concerns and offices to discontinue their telephones. An effort is being made to organize another telephone system for Dalton, and it is claimed parties are now ready to put up the cash to put the new system in operation.

"HELLO GIRL" IS NOT SLOW.

Ninety-seven per cent of all telephone calls in Milwaukee are answered in less than ten seconds. More than half of them, sixty-six per cent, are answered in less than four seconds. Six and one-half per cent of the calls are responded to practically instantly or within two seconds. These are some of the figures from the latest test sheet of the telephone company operating in the Cream City.

The same sheet shows that it takes the Milwaukee "hello girl" just 3.8 seconds on the average to connect the man who calls up the person with whom he desires to talk. The average time taken to bring two people together is 4.5 seconds.

"This shows conclusively that the man who kicks because he has to wait, should leave the telephone girl out of his calculations," said a Milwaukee telephone man. "The delay in nearly all cases where there is a delay is attributable to the failure of the man at the other end of the line to answer."

The test sheet also shows that Milwaukee people are usually at home. The percentage, naturally, is made up almost entirely of residence telephones.

Rapid Telegraphy

PATRICK B. DELANEY

RAPID telegraphy is the designation by usage given to systems requiring composition of the message on a tape as a preliminary to transmission by mechanical means over the wire, and recording of the message in Morse characters on a tape at the receiving station, requiring transcription before delivery.

BAIN AND WHEATSTONE.

Two kinds of rapid telegraphy have now been worked out, the ink-recording system of Wheatsone, so long the standard, and, just recently, the chemical recording method begun by Alexander Bain nearly sixty years ago. He was the first to propose a perforated tape as a stencil for transmission of signals, but he had no efficient machine for making it. His chemical system was much faster than the Wheatstone ink-recording system which came along a little later with a good perforator. Bain's speed was ahead of the necessity of the times, nor had he, being a runaway apprentice from Scotland, the backing for successful competition with his powerful English rival.

Wheatstone's perforator may be said to have anchored his comparatively slow system in the English service. When the government took over the telegraph lines, the best efforts of the brightest men were directed to the improvement of the system generally, until, under the administration of Chief Engineer Sir William Henry Preece, a speed of 400 words per minute was reached in a trial between London and Newcastle, a distance of 278 miles.

This was about equal to the highest chemical recording up to that time, fifteen years ago, and required approximately 200 movements of the armature of a polarized relay per second.

EXPERIMENTAL AND WORKING SPEEDS.

In all kinds of telegraphy, however, manual and machine, the gap between the practical or average working speed and the experimental maximum is very wide. Morse operators have sent fifty-one words in a minute by key, but the average rate is fifteen words a minute.

The Wheatstone speed between London and the cable stations in Ireland, about 400 miles, is from seventy to eighty words per minute. These circuits, however, comprise considerable underground and underwater cables.

In this country it is claimed that seventy-five words per minute each way is obtainable by Wheatstone over a duplexed wire between New York and Chicago through a repeater.

LIMITATIONS OF ELECTROMAGNETIC WORKING.

The obstacles in the way of higher speed and reliability for the Wheatstone system are both mechanical and electric. The transmitting tape will not bear any greater strain or impact by the contact controlling rods, and the electro-magnet of the receiver will not respond reliably at a rate of over forty impulses a second and leave any margin for change in the circuit. With the best designed instruments and the most approved expedients for improving the definition of impulses, the responsiveness of the electro-magnet falls at least ten times below the recording speed of the latest chemical telegraph, and for reliability of operation the electro-magnet is not to be compared to the chemical system.

The higher the speed the smaller the margin of stability of magnetic working. This rule applies to all electro-magnetic systems, so that an important drop from the occasional possible rate is necessary for continuity of operation.

Notwithstanding that the highest development of electro-magnetic telegraphy leaves about nine-tenths of the signaling capacity of the wire unused, *the electro-magnet is the foundation of all the telegraphs in use to-day. The Morse, single, duplex and quadruplex, synchronous multiplex Morse, and all printing systems are based upon it.*

AMPLIFICATIONS OF THE MORSE AND SYNCHRONOUS SYSTEMS.

Amplifications of the Morse beyond single transmission are, as is well understood, due to combinations of polarity and potential increase, enabling the different circuits to be operated at actually the same time. Synchronous multiplex Morse is based upon the rotative distribution of the time of the line among four or six operators. The transfer is made so quickly from one pair of operators to another pair, and so on progressively until its return to each, that no break in the continuity of connection is manifested by the receiving relay. The line being given to each corresponding sender and receiver in its entirety about forty times per second, it is impossible for the sending operator to miss connection, even though he should work his key at the rate of fourteen or fifteen excursions per second, the limit of hand manipulation. Thus, although all the keys are worked simultaneously the line is only connected to one at a time. With this system, circuits may be operated all in one direction, or divided into opposite directions like separate wire circuits.

PRINTING SYSTEMS.

Synchronous multiplex printing circuits are apportioned among different operators in the same way, but instead of the circuits being smooth and apparently continuous for each operator, as in the Morse multiplex, they are worked on selective or step-by-step principles, or combinations of both. Thus like the Morse, all printing telegraphs are based upon the electro-magnet, and although there is wide difference in their method of operation, in all of them the receiving electro-magnet must respond to every impulse transmitted over the line.

Taking into consideration the constantly changing electrical conditions of the circuit, the exceedingly small margin of adjustment permitted by differential balancing for quadruplex Morse, and the high rate actuation of the relay armature in the Wheatstone and printing telegraphs, the instability of such systems, outside of single transmission, or at best polar duplex Morse, constitutes a most precarious dependence.

DISTURBING ELEMENTS FOR ELECTRO-MAGNETIC TELEGRAPHY.

Up to about ten years ago atmospheric change was the main cause of disturbance in telegraphy, but at present the stray currents from power transmission are much more demoralizing, so that taking these effects together, it has become most difficult to maintain balances and adjustments. Indeed the Morse quadruplex is already regarded as having had its day. Fluctuation between ten and seventy volts are not uncommon on many routes, and as the tendency of power transmission is strongly in the direction of higher voltage, the outlook for ground-return telegraph circuits is very menacing to electro-magnetic systems. The only safe refuge for these will be in metallic circuits which will bring the most perfect quadruplex down to the present duplex rank, while printing systems using combinations of single, double and increase currents, and depending on emphatic

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delivery of every impulse, have certainly no better prospect ahead.

POLAR DUPLEX AND TYPEWRITERS BEST PRINTING TELEGRAPH.

The results reached by the exceedingly ingenious printing systems devised by clever inventors during the past few years have not altered the opinion held by the writer for a long time, that the best printing telegraph, and the most efficient and economical development of Morse working, is a polar duplex, manned by four first class operators and using typewriting machines for receiving.

The superiority of this plan is just now being more strongly emphasized than ever before by the introduction of the keyboard transmitter. Here the intelligent operator with his simple sounder obviates all the electrical and mechanical complications of the printing telegraph machine, and wastes no time. He can space, paragraph, rub out, change blanks, and do all that the sender tells him,—and much more if necessary, without being told. The organization is mobile, practically noiseless and takes up little space. It is always ready, requires no expert supervision, and with an average speed of twenty words per minute for each circuit yields, all things considered, the best output of any electro-magnetic system—Morse or printing.

BEST RESULTS OBTAINABLE WITH PRESENT SYSTEMS.

Notwithstanding the high speeds claimed for various printing systems, and taking the officially published results of eighty words per minute for a quadruplex over an ideal circuit with picked operators, and premium pay for each message handled over a certain number, and with permission to abbreviate and use arbitrary code signals for shortening the key work, *as its extreme achievement;* it is safe to say that the best facility derivable from a telegraph wire, with Morse, or printing system, day in and day out, and for all the minutes of the day, will not exceed an average of sixty full words per minute. Even this output is, for the reasons stated—increasing leakage from power wires, and frailty of adjustments—sure to drop to the duplex standard of forty words per minute. At times the advantage of the quadruplex over the duplex reaches thirty words per minute, but at an expense of four expert operators.

MORSE WIRES OR FASTER METHOD OF OPERATION.

It must be obvious, therefore, that these limitations for systems, which up to the present time have carried all the telegraph business, leave but two alternatives for meeting growth of traffic or for *permitting it to grow,* viz., increase of wires, or further utilization of the carrying capacity of the present wires by rapid automatic methods of operation.

PREFERRED AND ORDINARY BUSINESS.

The great volume of what is known as "broker" business, amounting, it is said, to about 40 per cent of the whole, and the incomparable fitness of the Morse sounder for this work is, doubtless, largely responsible for the lack of broadness, shown by telegraph companies in dealing with the problem of electrical correspondence generally. For this reason the decision has always been in favor of "more wires," relying for justification wholly upon the record for efficient handling of that portion of the traffic originating with interests having the power to enforce good service. It should be remembered, however, that promptness in handling this preferred business has been at the expense of that large portion belonging to the diversified community lacking the concentrative pressure necessary to secure equal treatment at the same cost.

This is why exchange traffic has so rapidly increased, while ordinary mercantile and social telegraphy has almost stood still.

That it is possible to keep on adding new wires and carrying messages by Morse, no one will deny; but so long as the profits will arise still from inadequate facilities for more than one-half of the business, no important expansion of telegraphy may be looked for.

To bring the ordinary telegram time within reasonable range of the "broker" message would require such an increase of wires as would quickly force higher utilization of the carrying facilities of existing ones.

EXCHANGE BUSINESS WILL ALWAYS BE QUICKEST.

It may be conceded that it is too much to expect that general telegraphy will ever be conducted as quickly as the exchange business, but many are of the opinion that the time has come for an improvement in ordinary telegram transmission speed, a decrease of cost, and, as a natural consequence of both these factors, a development of telegraphy to many times its present volume.

COMMERCIAL SIDE OF TELEGRAPHY.

Figures explanatory of the commercial side of the telegraph business, covering a period of about twenty years back, seem to show, that as at present conducted, the rate cannot be lowered, and leave fair dividends for stockholders on the capitalization basis adopted by the companies. It would seem, therefore, that owing to the engineering difficulties in the way of duplication of lines, and in view of demonstrable improvements in rapid transmission, an important departure in the method of carrying the bulk of electrical correspondence must soon be inaugurated.

The limit of electro-magnetic quickness having been reached—not considering the speed due to supersensitiveness and most favorable conditions, but the positive actuation which must be insensible to outside effects—the result makes it plain that telegraphy can only reach its full growth and occupy the extensive scope legitimately belonging to it by the use of machine transmission, which will operate up to the physical capacity of the wire, instead of making the nimbleness of the operator's fingers or the movement of a relay armature the limit.

SUPERSENSITIVE SYSTEMS IMPRACTICABLE.

Many inventors have labored under the erroneous belief that high speed working was to be reached by devising apparatus of great delicacy, only to find that beyond a certain point this characteristic was, on land lines at least, a positive drawback, as the highly sensitive apparatus proved, to a fatal degree, amenable to stray currents and inductive effects abroad in the earth and the air. The telegraph of the future must be a comparatively rough-shod affair, oblivious to foreign influences, and capable of high rate actuation by the margin of current over-riding.

THE CHEMICAL SYSTEM.

In the chemical system alone can these conditions be obtained. The receiving tape can be made irresponsive to all outside effects, and, at the same time, susceptible to a stronger signaling current, up to the limit of impulse definition over the line.

The chemical system is unaffected by ordinary fluctuation in the working current. Changes which would cause signals to drop out of any electro-magnetic system, and call for readjustment of apparatus, have no effect on the chemical system, beyond production of a lighter or heavier record in the tape. No dots or dashes are missed. The record is all there, a true reproduction of the characters on the perforated tape.

OBJECTIONS AGAINST AUTOMATIC TELEGRAPHY.

The main objections raised against automatic telegraphy, by the uncompromising adherents of the primitive method, have been the necessity for perforating messages for transmission, and transcribing them before delivery, it being claimed that these processes cause delay. But those who argue from this standpoint lose sight of the fact that, with a sufficient number of perforators and transcribers, the delay need not exceed four or five minutes at most, and that

if it average fifteen minutes it would then be about ten minutes quicker than the average Morse time, for while a single message may be sent off by key in a minute, messages do not come to the operator's table one at a time. There may be a dozen at once, and this accumulation entails a delay on all that come after.

AVERAGE DELAY.

The average delay throughout the United States for messages between the time of reaching the operator's table for transmission, and passing from the receiving operator's hand, is probably close to half an hour, more than half of which is due to limiting the messages load of a wire to the expertness of the sending and receiving operators. Such a course may be likened to the restriction of a railroad's track facilities to its gate accommodations at the terminals, and building another track and establishing another gate when travel increases, instead of adding another gate and running trains faster.

To provide each pair of operators with a circuit, when one wire may be made to keep forty pairs employed at regular speed, seems wasteful. Surely the greater the number of operators kept busy by a wire the greater the economy. Long wires and their maintenance require large outlay, and companies cannot much longer afford to neglect their carrying capacity.

RELATIVE ACCURACY OF MORSE AND AUTOMATIC.

The other objection put forth against automatic working forces the conclusion that it is prompted by prejudice solely, since it has no foundation whatever. It is, that more errors are made by the recording system.

As nearly everybody knows, messages over ocean cables are the most difficult known in telegraphy. The majority of them are in code words having neither context or meaning to guide the operator. These messages are nearly all perforated on tapes, and sent by machine, not only on account of some increase in speed, but mainly because of the greater accuracy of the automatic over hand working.

No better evidence of superiority in this most important regard could be cited than the fact that every cable message transmitted over land lines by Morse sounder must, under the rules of the company, be *repeated back* by the receiving operator, so that the sending operator may be certain that the receiving operator reads it correctly. No such verification is practiced over the cable. No Atlantic cable company would work by sound if it were electrically practicable to do so. They require the automatic system because of its correct record. Anyone acquainted with the subject knows well that the cable tapes with their wavy lines are far and away more difficult to read than the simple dots and dashes of the Morse code, which can be learned in a few hours.

The exact degree of accuracy in telegraphy is difficult to fix, but it is well known that the land line sounder errors, with messages made up of plain English, are ten times more numerous than cable errors with words without meaning. Indeed, a land line mesage without some error is exceptional. Usually the receiver may construe the meaning intended, and the error is passed over.

About four-fifths of all the messages transmitted on the continent of Europe are read from tapes, the balance being carried by printing systems. There is no reading by sound, and yet, no one has claimed that more errors are made over there than on this side of the water.

QUALITY OF MORSE WORKING WITHIN HEARING.

Anyone well trained in sound reading tarrying within hearing of the average Morse wire, in hotels, office buildings, or railway stations, must marvel at the quality of the service upon which the telegraph business of the country depends. Here he has an insight, not only into the capacity of the branch office operator, but also of the operator at the main office, with whom he is working. The experience leaves no escape from the conviction that telegraphy, the most important of all means of communication, is conducted in a strikingly inefficient and stinted way, which, if persisted in, must render any improvement in the utilization of the telegraph by the public impossible.

KEYBOARD TRANSMITTER.

That the inadequacy of the Morse key is at last being recognized is proven by the introduction of keyboard transmitters, by which a single depression of a key causes all the dots and dashes of a letter to be sent in a perfectly correct way. This, it is to be hoped, marks the first step in the direction of automatic telegraphy.

GAP BETWEEN EXTREMES OF SPEED.

As already stated there is, and always will be, a large amount of business demanding transmission as near the instanteous as it is possible to get. This is the speculative business between exchanges, and for this work Morse working has no equal, not necessarily key transmission, but transmission by some practically direct means and reception by sound.

Before referring to the developments in high speed transmission and chemical recording which reach the limit of telegraphy, there are important modifications which fill the abrupt and wide gap between the slow Morse and this extreme capacity, and which, combined with the simple Morse circuits, and the high speed automatic method, form an organization complete for all needs and conditions included in the most comprehensive conduct of electrical correspondence.

MORSE WORKING HAMPERED BY THE KEY.

It is well known that in these days Morse working is hampered one-half by the key. In the old days the keyman could send as fast as the reader by sound could put the words down with a pen, but for fifteen years past the typewriter machine has enabled the receiver to take things very easy with the fastest sender. It is fair to estimate that the receiver could average forty words per minute, but he is held down to the Morse key rate of fifteen words.

IMPORTANT MODIFICATION OF RAPID TELEGRAPHY.

The modification of the rapid system adapted to this intermediate stage, between the extremes of speed, consists of a *perforator machine which may be operated by the ordinary Morse key* at the highest speed of the most expert operator. With two such machines an automatic transmitter may be fed with perforated tapes and messages sent over the line at a rate up to highest ability of the typewritist receiver. In this way one receiving operator will take as much as two key senders can put on the tapes, thus doubling the facilities of a circuit, with one operator less, for the same amount of work. The messages coming from the key perforator may be automatically alternated through the transmitting machine, so that whenever there is more than one message on hand they are divided between perforators, and being sent off at double speed, the delay will be less, on an average, than at present, with an average accumulation of four or five messages on each operator's table during the busy hours, even when the wires are all working.

IMPROVED SIGNALS AND DOUBLE SPEED.

The automatic Morse transmitter delivers much better signals than could possibly be sent by key direct, for no matter how light or heavy the operator's manipulation may be, the holes in the tape are all of the same size, and consequently all the impulses sent over the line are of the same value.

As the tape runs continuously through the perforator, spaces and dash lengths correspond to those made by the operator, but the impulses of which the dots and dashes are formed are absolutely uniform, so that they carry much

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better over the line than the uneven impulses usually made by the key.

With two perforating operators working at twenty words per minute, the automatic transmitter will deliver the forty words in a minute in greatly improved Morse to the receiving operator, who, if an expert, can maintain that speed. The receiver can break or stop the automatic transmitter, which can easily be attended by the perforating operators, all the apparatus being on the same table.

In this way the Morse capacity of a circuit may be at least doubled, so that a duplex becomes equal to quadruplex in output, with six operators against eight, and a quadruplexed wire may be made to carry double the number of messages with twelve men doing the work of sixteen.

AUTOMATIC MORSE TRANSMITTER DETERMINES GRADE OF RECEIVING OPERATOR.

The automatic transmitter at once determines the grade of the receiving operator, and can be regulated to his ability instantly, whether he be a ten or a forty word per minute man.

PERFORATING FROM A DISTANCE.

Another important feature of the perforating machine is that it can be operated from any distance, or over any circuit where it is possible to work a relay; thus branch, suburban, or way offices can, by the Morse key, perforate their messages at the central office for high speed transmission over trunk lines.

REPRODUCTION OF TAPE INSTEAD OF REPEATERS.

For transmission over long circuits where automatic repeaters are now necessary, a perforated tape put into the transmitter in New York will reproduce itself in perforations at Buffalo, and this tape may be started in another circuit to Chicago, and so on to San Francisco, each reproduction serving for retransmission to the end, where the message may be taken by sound at forty words a minute, a speed easily maintained over the different sections, which are worked independently, thus avoiding the cumulative effects of interdependence between repeaters, which lowers the speed to about twelve words per minute, New York to San Francisco.

HIGH SPEED OF AUTOMATIC TELEGRAPHY.

In the high speed automatic transmission and chemical recording system, as now perfected, is realized the best practical and theoretical results for telegraphic traffic of large volume.

Its speed is limited only by the impulse conveying efficiency of the wires—or the delivery of impulses of sufficient power to make a mark on the chemical tape by electro-chemical action on the iron recording wire, and with plainness permitting of ready transcription.

Heretofore, chemical telegraphs have used sending tapes having regular dots and dashes cut into them, and sending short and long impulses of one polarity. With a line of any considerable length, or electro-static capacity, these characters, when sent at anything approaching high speed, were run together by the discharge from the line, known in telegraphy as "tailing," so that transcription was difficult and unsafe. Recent improvements have entirely overcome this most serious drawback, and removed the main obstacle in the way of reaching the full carrying capacity of a line.

The perforated message is made up entirely of dots. No dashes are perforated or transmitted. All impulses have the same time value, and each succeeding one is of opposite polarity to the one before it. The time elapsing between a positive, marking impulse and the negative, cutting off or spacing impulse, determines whether the character is a dot or a dash.

In preparing the perforated tape with Morse key, when the operator presses his key down, a hole for a positive impulse is made in the tape, and though the key be held down indefinitely, but this one hole is made, and the tape continues to run. When the key is let up, a hole for a negative impulse is made. Thus the holes for dots just clear each other from the vertical, while the holes for dashes are at an angle corresponding to the time the key was held down.

UTILIZATION OF STATIC DISCHARGE.

Through these holes positive and negative impulses, or marking and spacing currents, are sent. A negative immediately following a positive permits only a short mark on the receiving tape, but when the negative impulse is delayed a dash is produced. The impulse for the dash is the same as for the dot, but as it is not followed by the reversal for some time, the discharge current running out of the line, after the circuit is broken at the transmitting end, completes the dash. The length of mark made by this prolonged current depends upon static capacity of the line, the rate at which the tape is running, and the delay of the negative impulse.

Should the normal capacity of the line be insufficient for the longest dash in the Morse code, the necessary amount is made up by placing a condenser between line and earth, either at the sending or receiving end, or elsewhere.

"CAPACITY" AN AID TO SIGNALING.

About 300 miles of average pole line affords ample discharge for dashes at a speed of 1,000 words per minute. Short cables in the line, instead of being a hindrance, as in the case of the electro-magnetic system, contribute to perfect signaling.

Added artificial capacity need not be altered to compensate for changes of weather—the margin being wide.

DISTURBING CURRENTS IGNORED.

Speed depends upon voltage, and character of the line. A certain amount of current for a certain period is necessary at the recording finger of the receiver to make a plain record, and here it may be again remarked that in these days the conditions abroad in the land do not warrant the use of the most delicate instruments, or supersensitive solutions for telegraphic recording. On the contrary, the receiving tape should be sufficiently unconscious of stray currents and inductive effects to ignore them in the record,—responding only to the impulses from the transmitting station. With this safe margin the Rapid System is immune to interferences fatal to high speed or finely balanced electro-magnetic systems.

Atmospheric changes requiring constant adjustment and balancing of the latter apparatus has no effect on the automatic, except to change the density of the mark. *No signal can be dropped out or mutilated.*

The longest lines can be worked direct, without repeaters, at a speed proportioned to the distance.

Perforation by Morse key needs no special staff of operators.

KEYBOARD PERFORATOR.

The latest improvement, and one of far reaching importance, consists of a perforator worked by a keyboard transmitter, so that any typewritist can perforate without even knowing the Morse code, and owing to its perfect uniformity of action, the record from this machine perforation can be transcribed almost as rapidly as copying from print.

EIGHT THOUSAND WORDS A MINUTE.

Mechanically, the rapid transmitter apparatus may be run at any speed up to 10,000 words a minute, 8,000 words, or 2,500 impulses a second, having been recorded over artificial circuit. As the sending contacts are made by wire brushes pressing toward each other above and below the tape, there is no injurious sparking, since the arc is brushed out by the tape and the contact kept clean by the edges of the holes.

AUTOMATIC CONTROL OF APPARATUS.

The receiving machine is entirely under control of the transmitting operator, and can be stopped at any stage. Likewise, the transmitter can be stopped by the receiving operator, and contact with outside wires will stop both machines. All tapes, sending and receiving, are automatically wound on reels as they pass through the machines. There are no loose and fluffy bundles of tape in evidence. The receiving tape is only slightly damp. It is not handled by anybody, being drawn in short installments in front of the typewritist transcriber by a mechanical contrivance controlled by the foot.

EFFECT OF RAPID TELEGRAPHY ON INSTALLATIONS.

With rapid telegraphy there will be fewer wires, greater stability in construction, and a full utilization of their carrying capacity.

SYSTEM SUPERIMPOSED ON TELEPHONE CIRCUITS.

The system can be operated over a telephone circuit without interference with conversation.

GREAT FIELD FOR DEVELOPMENT OF TRAFFIC.

Rapid telegraphy foreshadows great changes in correspondence. Outside of the present telegraph business there is a vast and profitable field for development of an electrical correspondence for which the trains are too slow, and the present telegraph and telephone too expensive and inadequate.

TELEPHONE CANNOT COMPETE.

The telephone cannot compete with the telegraph for long distance communication. Its average is not more than sixty intelligible words per minute, or thirty words per wire, which is twenty to thirty words below the present telegraph wire speed, and only about one-fortieth of the number of words that can be recorded by rapid telegraphy. Long distance telephony is commercially possible now only through the rental of superimposed Morse telegraph circuits, two of which are obtained from the metallic circuit of the telephone.

DIFFERENCE IN MINIMUM CHARGE ASSURES SUPREMACY OF TELEGRAPH.

The difference in the minimum rate of the telegraph and the telephone must always sustain the supremacy of the telegraph for distances of over fifty miles. Forty cents for a ten word telegram, and five dollars as a minimum for three minutes talk, New York to Chicago, leaves the telegraph practically without a competitor; and when, by the rapid system, availment of all that a wire can carry is had, delivering to the customer a typewritten letter of 180 words, or the telephone five dollars' worth, for say seventy-five cents, the permanent prevalence of the telegraph as the great medium of communication and correspondence will be indubitably demonstrated.

TELEPHONE AND POST OFFICE COLLECTION AND DISTRIBUTION FOR RAPID TELEGRAPHY.

Millions of local telephones will collect and distribute telegrams for high speed work over trunk lines. The post-office will also be used for collection and delivery of telegraphed letters. Between cities separated by any considerable distance all correspondence of any urgency will be telegraphd at a cost so moderate that the wire will supplant the train as a mail carrier and the relation between miles and time will be practically set aside.

QUICK TELEPHONE SERVICE.

"What is the average time required to receive a telephone call and make a connection?" was asked of a man prominent in the management of a big telephone company a few days ago. The inquiry was prompted by a remark that telephone service has wonderfully increased in efficiency within the last few years.

"In some of our exchanges," was the reply, "the service tests show that less than three seconds elapse before the operator answers. Of course, the time required to complete the connection depends entirely upon the party at the other end."

The introduction of the "multiple" operating system in connection with the central energy or "common battery" form of transmission is largely responsible for the improvement in efficiency of operation in telephone plants. The methods of receiving a call in the exchange and making a connection is interesting.

When the telephone user removes the receiver from its hook, a spring in the stock of the telephone pushes up the stem of this hook, completing a circuit to the exchange. This lights a small electric lamp in front of the operator at the switchboard. The operator, seeing this light, picks up a brass plug attached to a cord and connecting with her own head telephone. Upon inquiring and being told the number she takes the opposite end of this cord and, with the end of the plug, touches the edge of the "jack" of the multiple of the number wanted. If the line wanted is "busy" she will receive a slight click in her ear. The party calling will also notice this click. If the line is not busy the operator plugs in and a second electric light will show. The connection being made, the operator, by pressing a button, sends a strong current of electricity through the wire and the bell on the instrument of the party desired rings.

When this party answers by taking his receiver from its hook, both lights on the switchboard go out and the operator knows the parties are talking. There is now no need for the operator to go in on the line unless he be summoned by the intermittent flashing of one or the other of the lights, showing that someone is shaking the hook to secure her attention.

When the conversation is finished, both lights again flash. If one party desires another connection and does not replace his receiver, his light will remain burning. Thus in every operation, the operator knows by visual means just what to do, relieving her of any necessity or excuse for cutting in on conversations.

On a multiple switchboard, a "multiple jack" or orifice in which to insert the connecting plug for every subscriber to the system, is within the reach of every operator. This is the secret of the quick service. The long-distance operator is also in direct reach of every local subscriber so that there is really but a single middle party between the telephone user and every other subscriber.

TELEPHONE BEATS AUTO.

W. S. Grady, a Chicago chauffeur, who had fun recently with the police of Kokomo, Indiana, by having them chase him all over the city while he ran his touring car at top speed, was caught and made to settle for his escapade after he was out of the city, and well on his way toward home. A telephone message from the Kokomo officers to the Logansport police led to his arrest there when he stopped to replenish his gasoline supply. When first taken into custody he denied that he was the man wanted in Kokomo, but the Logansport officers were sure of him and threatened to lock him up if he refused to settle for the infraction of the Kokomo speed ordinance. When he saw that he was cornered, Grady admitted his misdemeanor, asked that the amount of the fine be ascertained at once, and, upon being told the amount, settled on the spot. As he handed over a crisp roll of bills he laughingly remarked that he had miscalculated when he figured that an automobile could beat the telephone.

XUM

WARNER ELECTRIC COMPANY.

The Warner Electric Company of Muncie, Indiana, realizing something of the possibilities of the Independent telephone field, was organized in February, 1898, for the purpose of putting before the telephone public a line of apparatus possessed of merit. How well the company has succeeded in doing this is well known by the Independent public throughout the United States.

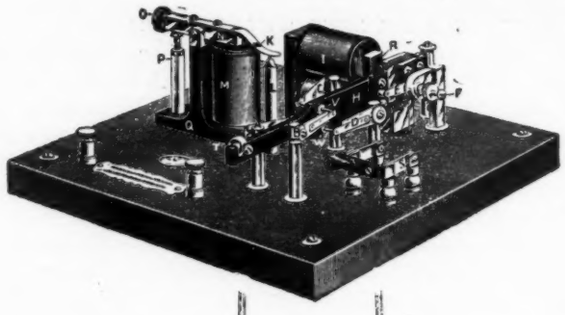
T. W. Warner, general manager of the concern, realized the need of an automatic signaling or calling device to take the place of the laborious hand magneto generator, and the necessity of a self-contained and reliable means of calling or signaling subscribers, or rather a practical and economical battery power generator. Considerable money has been

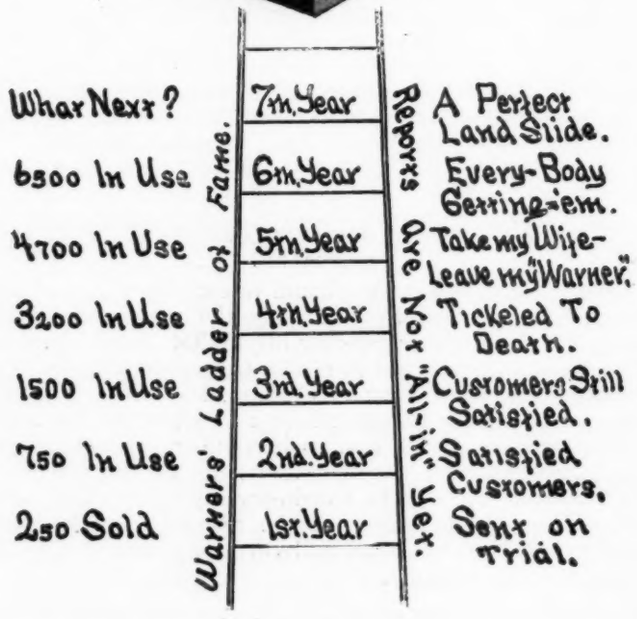
T. W. WARNER, GENERAL MANAGER.

expended and a great deal of energy has been exercised by him in producing apparatus to get the desired results; and after much experimenting with induction, automatic, and in all some fifteen different kinds of devices, none was found to be practical until finally a machine called the Warner pole changer was decided upon.

This company has always shipped its pole changers subject to thirty days' trial, enabling all operating companies to determine whether they were getting value received, and on such business principles has won the confidence of the Independent telephone public to the extent that in the seven years of its existence this company has built up a very large business.

Their factory building, illustrated herewith, has 15,000 square feet of floor space and is equipped with the latest automatic machinery, driven by five five-horsepower motors,





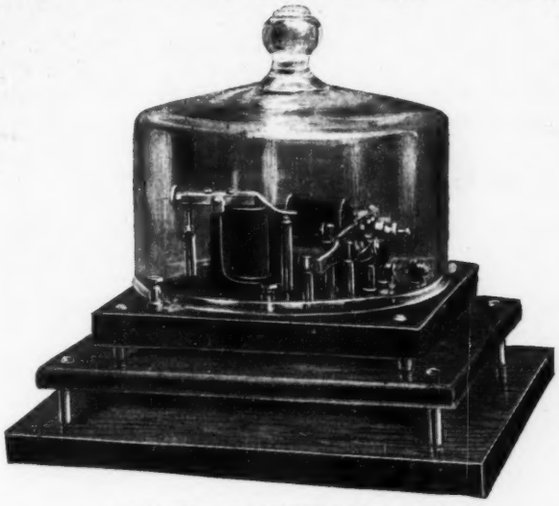
WARNER POLE CHANGER AT TOP OF LADDER.

two three-horsepower motors, and several smaller motors. The building is equipped throughout with an automatic sprinkler system, making the plant practically fireproof. The factory building is situated on both the main line of the Lake Erie & Western Railroad and the C., C., C. & St. Louis Railroad. The main offices, consisting of four rooms, are located downtown in a modern office building.

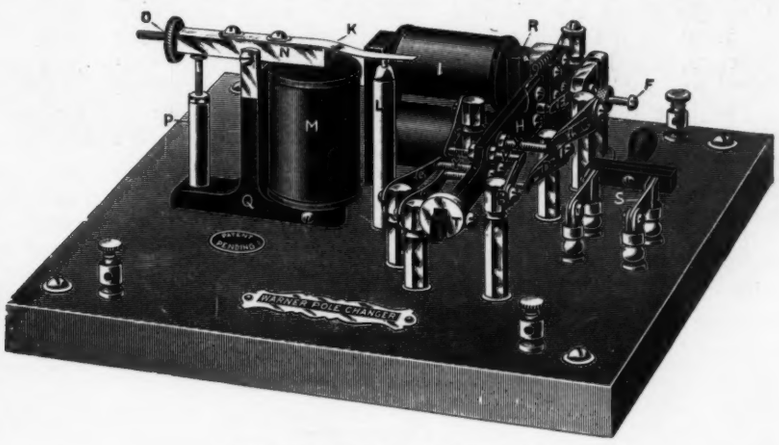
There is a large force employed and the pride of the Warner Electric Company is that shipments are made the same day orders are reecived, which has built up for this company an extensive business.

T. W. Warner, as general manager, has devoted much time and energy to developing and standardizing apparatus for furthering the cause of Independent telephony. He was

born in Shelbyville, Tenn., thirty years ago, and at an early age entered the electrical field, devoting the greater part of his time to electric lighting, until 1894. Soon after that



WARNER STANDARD POLE CHANGER.

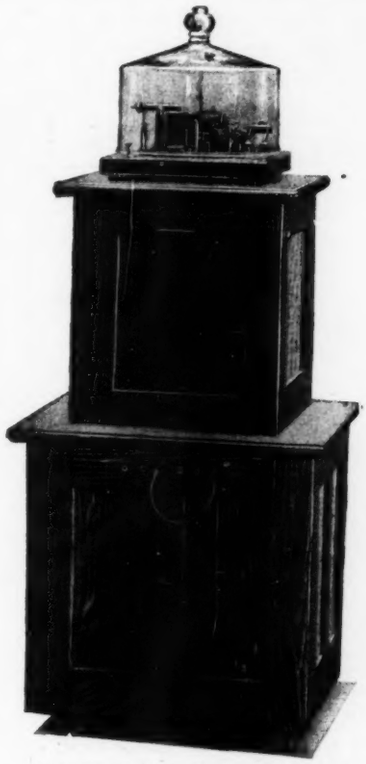


WARNER POLE CHANGER IN DETAIL.

date he constructed an Independent telephone system in Northwestern Montana, connecting some valuable mines with the outside world and building a toll line seventeen miles long, with over 5,000 feet elevation in this distance, and cutting the right of way through a forest.

Mr. Warner is prominently identified with the Independent movement, being a stockholder in Independent exchanges at Muncie, Anderson, Elwood and Alexandria, Indiana. He is a man of practical, original ideas, and through his extensive and varied experience in the telephone field has made many friends.

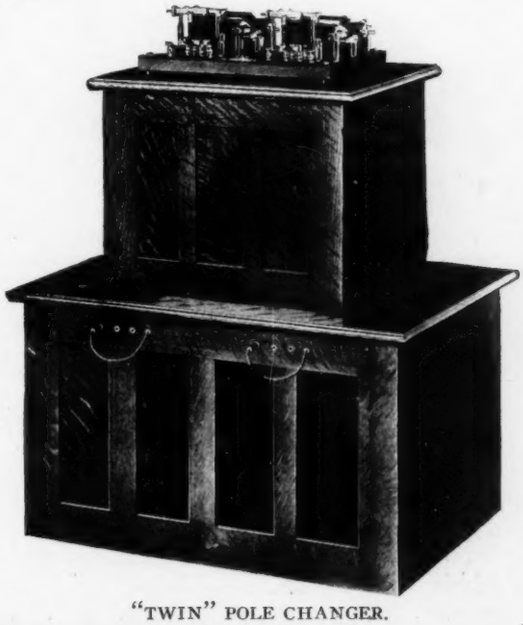
The illustration herewith demonstrates the increase of



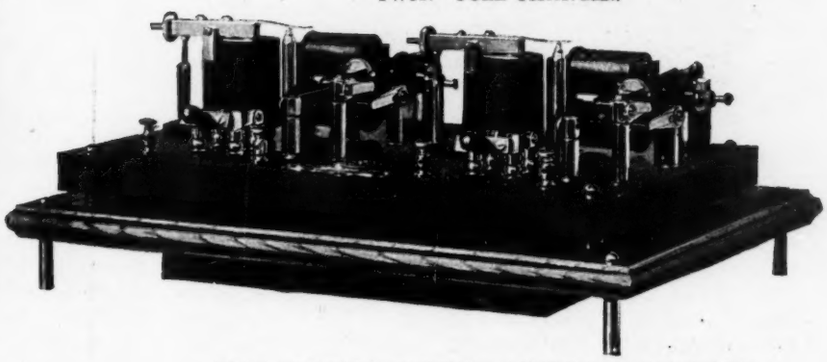
WARNER DRY BATTERY OUTFIT.

sales and the recognition of the practicability of Warner apparatus by the telephone public. This ladder is used to typify the ascent of the Warner pole changer. Each rung designates an advance, and from the 250 sent on trial during their first year of manufacture this business has reached its present proportions.

The Warner Standard pole changer, mounted as shown in the cut, illustrates the machine complete, except the batteries. One cell of closed circuit battery, and about fifty cells of either dry or solution batteries, will be required—and as some exchanges have a large supply of batteries on hand, they prefer this outfit to the dry battery outfit, as illustrated.



"TWIN" POLE CHANGER.



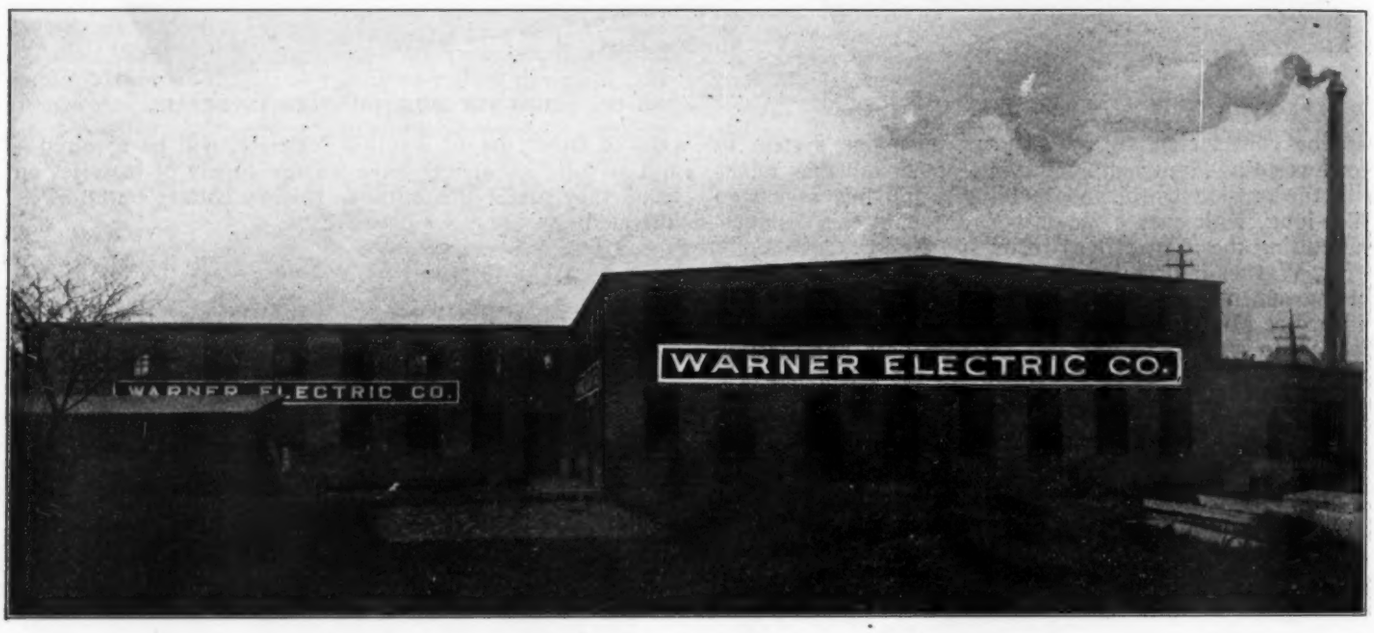
POLE CHANGER WITHOUT CABINET OR BATTERIES.

The Warner dry battery outfit consists of sixty "best quality" dry batteries, one closed circuit battery for operating the vibrator (one charge of this battery will operate the vibrator continuously from ten to twelve months, and

much longer if shut off at night), one special condenser and one Warner pole changer, all contained in a handsome paneled oak cabinet, having glass cover as shown. The cabinet occupies a space of about 18x20 inches, and is about forty inches high over all. When crated ready for shipment it weighs about 200 pounds. The plug switch shown on the front of the cabinet is for the purpose of cutting the batteries in and out. In most cases thirty batteries are sufficient to do the hardest ringing, leaving a reserve of thirty.

The pole changer, as shown in detail, it will readily be seen, is simple in operation. The vibrator, which carries the positive and negative currents, is actuated the same as an ordinary door bell, having the same motion as a pendulum to a clock.

The twin pole changer has two pole changers, mounted on top of the cabinet, which contains the necessary batteries with dry or solution cells. This "twin" pole changer is not necessary on exchanges smaller than 1,500 to 2,000 subscribers, as the standard machine is quite sufficient; and when this machine is used, a bank of storage batteries is advised, to furnish the ringing power.



FACTORY OF WARNER ELECTRIC COMPANY AT MUNCIE, INDIANA.

A NEW ACCOUNTING SYSTEM.

The Elyria Telephone Company of Elyria, Ohio, is just completing its new multiple tap cable system, having installed several thousand feet of underground cable and more than 100,000 feet of aerial cable. This company has also lately installed a new multiple common battery switchboard of the central energy type. It is the intention of the company to install several different kinds of service—individual, party line and measured—which will apply to both business and resident telephones.

The engineering and management of the plant is under the supervision of L. W. Stanton, consulting and construction engineer of Cleveland and Chicago. Mr. Stanton is rebuilding a number of plants and taking up the engineering and supervision of the management of same with a view of increasing the earnings of the plants. He reorganizes the various departments and through a system of records and reports keeps a close check on various departments, such as the cost of operation, maintenance, etc. The system of accounting is one which has been worked out by F. H. MacPherson, chartered accountant under the Canadian government, and Mr. Stanton. They have gone over a number of the leading telephone bookkeeping systems, and worked out a plan which gives clear and concise information.

By an agreement with the owners of the plants, the managers of the exchanges under Mr. Stanton's supervision are promoted to better positions as they prove themselves capable. Such a system is beneficial to the owners, and the men look for advancement.

A TELEPHONE "REMINDER."

A new and novel idea for presenting to Independent telephone subscribers the fact that the Independent exchanges are connected by long-distance toll lines has been put into practice by the Inter-Ocean Telephone and Telegraph Company of Buffalo, New York.

The idea consists of placing a neat and attractive ceiluloid sign immediately back of the mouthpiece on the transmitter. This reminder is before the subscriber every time he uses his telephone. This sign can be used universally by Independent telephone companies, and sample of same, together with other information, may be obtained by addressing the Century Telephone Construction Company, Buffalo, New York, which is the originator of this idea.

ERICKSON INVADES AMERICA.

Papers incorporating the L. M. Ericsson Telephone Manufacturing Company under the laws of the state of New York were filed recently in the office of the county clerk of Erie county, New York. The capital stock of the company is stated in the papers of incorporation to be $200,000, divided into 2,000 shares of $100 each. The incorporators and directors for the first three years are Axel Bostroem of Stockholm, Sweden, Fenton M. Parke, a real estate man of Buffalo, and Attorney Carl H. Smith, also of Buffalo. Another man who is active in the organization of the company is K. Weman of New York city. The papers also state that the principal offices will be in the town of Tonawanda, Erie county, New York.

The papers are so drawn as to reveal as little as possible of the objects of the company and the men interested in it, but it is learned on the best of authority that the company intends to build a plant either in Buffalo or Tonawanda

for the manufacture of telephone transmitters, receivers and other telephone apparatus under the Ericsson Company's patents. This company's main plant is in Stockholm, Sweden, and has been doing business in Buffalo under the foreign corporation law, but without any manufacturing plant in the United States, the equipment being imported from Sweden. Now it is purposed to build a plant in Erie county.

THE SKELLEYPHONE.

The Skelley Manufacturing Company of Cleveland, Ohio, reports a large and increasing demand for its popular "Skelleyphone," an extension arm telephone that is guaranteed to save time, trouble and temper, illustrations of which are herewith shown. The "Skelleyphone," being without a heavy base and having all its working parts so constructed that by the loosening of one screw all the inside parts are readily accessible, marks an advancement in the line of a desk telephone. The opening of this one screw brings before the trouble man or inspector every part of the telephone and he can readily see that all springs are making contact, that all wires are in a good condition, and that all cord connections are securely fastened and under their proper binding posts.

SKELLEYPHONE ATTACHED TO DESK.

The action of the "Skelleyphone" is perfect; all bearing surfaces are machine finish and work smoothly together. It is fully nickel-plated and an ornament to any wall or desk. Nothing but the very best of material is used in its construction and only skilled workmen are employed in its manufacture. The company guarantees that it will stand usage for years without developing a weakness in any part.

The double clamp for carrying two telephones is indispensable in cities where two telephone systems are in use. Either telephone can be lifted from the carrying base without the unfastening of any screws and the telephones can be swung in any direction without tangling any cords.

Full particulars regarding the "Skelleyphone," and prices, will be sent upon application.

AWARDED THE GRAND PRIZE AT ST. LOUIS.

The Automatic Electric Company of Chicago has the honor to announce that the jury of awards of the Louisiana Purchase Exposition has awarded the grand prize to its exhibit of automatic telephones and switchboards. This award is for general excellence in Group 70, which includes all forms of telephone switchboards, telephones, telephone apparatus, appliances, appurtenances and supplies. The Automatic Electric Company was the only Independent telephone manufacturing firm to receive the grand prize, which is the highest award in the power of the exposition officials to make.

The company's exhibit was one of the most interesting and noteworthy at the exposition. It occupied a conspicuous position in Section 24, Palace of Electricity, and was housed in a splendidly appointed pavilion of its own. The exhibit proper consisted of a complete automatic telephone exchange of the 10,000 type, divided into two switchboards and having power equipment and all other accessories. To this exchange were connected a large number of telephones scattered throughout the exhibit and Palace of Electricity. The automatic service was in constant use by the officials of the electrical building during the entire fair and they complimented it in highest terms. The exhibit was in charge of Harry S. Durant of the sales department of the Automatic Electric Company, assisted by James Strasburg of the mechanical department.

The Automatic Electric Company has, within the past two years, equipped more than sixty cities in the United States with its automatic telephone apparatus.

DOUBLE CLAMP TELEPHONE ARM; SKELLEYPHONES IN USE.

EXHIBIT OF AUTOMATIC ELECTRIC COMPANY AT ST. LOUIS.

By a special fastener formed in the fiber base block the receiver and pedestal cords are so held in position that no pull or jerk on the cords can in any way effect their contact connection. The arms on which the telephone rests are the same as are used in the Skelley desk set holders and are of the best malleable castings. Every arm is interchangeable and fits any other arm or telephone that is manufactured by the Skelley company. The arms are made in any desired length and the bases fasten to any wall or fit either a roll or flat top desk.

RUNZEL-LENZ COMPANY.

The Runzel-Lenz Electric Manufacturing Company was organized in June, this year, and incorporated under the laws of the state of Illinois. The company was created for the purpose of manufacturing cords of all descriptions used in conjunction with telephone and switchboard work, also cables for switchboard and interior purposes, and insulated wires.

The plant is located at 97-101 South Clinton street, Chicago, and is modern in every respect. The machinery is all of the very latest pattern, and the facilities for manufacturing are the very best. Every effort is being centered in producing a line that, in quality, is second to none, the policy of the company being to manufacture the best that skilled workmanship and modern machinery can produce.

W. L. Runzel, president of the company, is a man of wide experience in an electrical manufacturing field, his efforts having been confined entirely to this particular industry. For a period of sixteen years he was employed by the Western Electric Company, his experience during this time having been confined to such departments as underground and switchboard, cable, cords and insulated wires. Previous to his connection with the Runzel-Lenz Electric Manufacturing Company, he was for a period of three years identified with the Stromberg-Carlson Telephone Manufacturing Company in the capacity of superintendent of the cord and cable department, including the underground cable department.

His duties with the Runzel-Lenz Electric Manufacturing Company are confined entirely to the manufacturing end of the business, and it is more than a fair assurance that all the products being manufactured under the personal and direct supervision of a man who has enjoyed so wide a practical experience, are first-class in every respect, as regards correct electrical construction, quality, etc.

Charles Venn, Jr., vice-president of the company, is the son of Dr. Charles Venn, one of Chicago's prominent physicians and surgeons. Mr. Venn has charge of the laboratory department, and under his supervision thorough tests are made of all materials, such as silks, wires, etc., used in the construction of the company's products. All materials

W. L. RUNZEL.

J. M. LENZ.

CHARLES VENN, JR.

GENERAL OFFICES THE RUNZEL-LENZ ELECTRIC MANUFACTURING COMPANY.

Cotton Winding Department. Cord Braiding Department. Cable Forming Machine.

Machine Department. Cord Finishing Department.

INTERIOR VIEWS IN THE RUNZEL-LENZ FACTORY.

used by the company are made according to its own specifications, thus insuring not only quality, but also correct electrical construction. Mr. Venn is a graduate chemist of the University of Illinois, and pursued his scientific studies in two of the European colleges, namely, the university at Feldkirch, Austria, and the university at Beldford, France.

J. M. Lenz, treasurer of the company, has charge of the selling end and the management of the business. He has had a large experience, covering a period of eight years, and has been identified with the two leading Independent telephone manufacturers. Previous to his connection with the Runzel-Lenz Manufacturing Company he was identified with the Stromberg-Carlson Telephone Manufacturing Company in the capacity of credit man.

The Runzel-Lenz company commenced business with the most gratifying prospects for success, and among the recent orders secured was one from the International Telephone Manufacturing Company of Chicago for several thousand feet of cable for a large foreign installation to be made at San Paulo, Brazil.

With the excellent facilities the company has, it is in a position to fill orders with an unusual degree of promptness.

DESK-SET MEASURED SERVICE METER.

The new desk-set meter of the Measured Service Company of Chicago is shown in the accompanying illustration. It is equipped with a handsome nickel base, which makes the base of the meter about one-fourth inch greater all around than this company's standard hole, so that the meter can

NEW DESK-SET METER.

quickly and easily be attached to any part of the desk (on the inside or the outside) without marring the furniture in any way.

This special base is constructed so that the three wires from the meter proper lead out through a single insulated outlet at the top of the base. This not only makes the wiring connection very simple, but makes it neat in every way and an even more attractive meter than the wall meter made by this company.

This design is called model "B" and will be ready for delivery within a few weeks. The mechanism is identical with model "A" manufactured by the Measured Service Company.

COOK GETS COLUMBUS ORDER.

Frank B. Cook of Chicago has received from the Automatic Electric Company an order for a complete distributing and protector frame for the exchange of the Citizens' Telephone Company, Columbus, Ohio. The capacity of the frame is to be 8,000 pairs, and it will be equipped with 8,000 pairs of Cook's No. 444 self-soldering protectors. Cook is particularly pleased with the order from the fact that it shows the confidence of the Citizens' Telephone Company and the Automatic Electric Company in his self-soldering protectors. Other orders which Cook has received from the Automatic Electric Company are as follows: Delaware Telephone Company, Wilmington, Del., type "L" frame, with a capacity of 2,500 pairs, equipped with 2,000 pairs of No. 444; Solvay Process Company's system, Syracuse, N. Y., 200 pairs; Home Telephone Company, Los Angeles, Cal., 900-pair addition to the East exchange; Home Telephone Company, Santa Monica, Cal., type "L" frame, 500 capacity, equipped with 360 pairs; Ocean Park, Cal., exchange, 500 pairs capacity, equipped with 300 pairs; Sawtelle exchange, 300 capacity, equipped with 160 pairs. Besides the foregoing, orders have been received as follows:

La Harpe Telephone Company, La Harpe, Ill., 200 pairs; United Telephone and Telegraph Company, for its exchange at Newport, Pa., a type "L 3" frame of 100 pairs capacity, equipped with 50 pairs; for the Littleston, Pa., exchange, a type "L 3" frame, 100 pairs capacity, equipped with 50 pairs; Mangum Telephone Company, Mangum, O. T., type "L" frame, 300 pairs capacity, equipped with 260 pairs; Suburban Telephone Company, Ferguson, Mo., addition of 60 pairs; E. Ritter, Marked Tree, Ark., 100 pairs; Kellogg Switchboard and Supply Company, for the telephone exchange at Freeburg, Ill., 100 pairs; Scott County Telephone System, Oran, Mo., type "L 3" frame, 100 pairs capacity, equipped with 60 pairs; Northeastern Telephone Company, an addition to the Lewiston, Me., exchange, 150 pairs. Cook has also received an order from the Eastern Telephone Manufacturing Company for the exchange it is installing at Union, N. Y., for the York State Telephone Company. This order was for a type "L" frame of 300 capacity, equipped with 60 pairs of No. 444.

Although Cook has been almost swamped with orders for his No. 444, this is not the only type of apparatus which he manufactures that has met with popular favor. His type "S. A." pole cable terminal is being favorably received. Orders have recently been received from the Easton and Bethlehem Telephone Company, Easton, Pa., for 77 of this type; Hawkeye Telephone Company, Des Moines, Ia., 13; Suburban Telephone Company, Clayton, Mo., 14 This terminal is very small and compact and it is claimed that the galvanized iron cover protects all connections from the weather.

WILLIAMS-ABBOTT FACTORY.

One of the finest and most perfectly appointed telephone manufacturing plants in the United States is the factory of the Williams-Abbott Electric Company at Cleveland, Ohio, comprising 50,000 feet of floor space, all of which is used by this well-known concern.

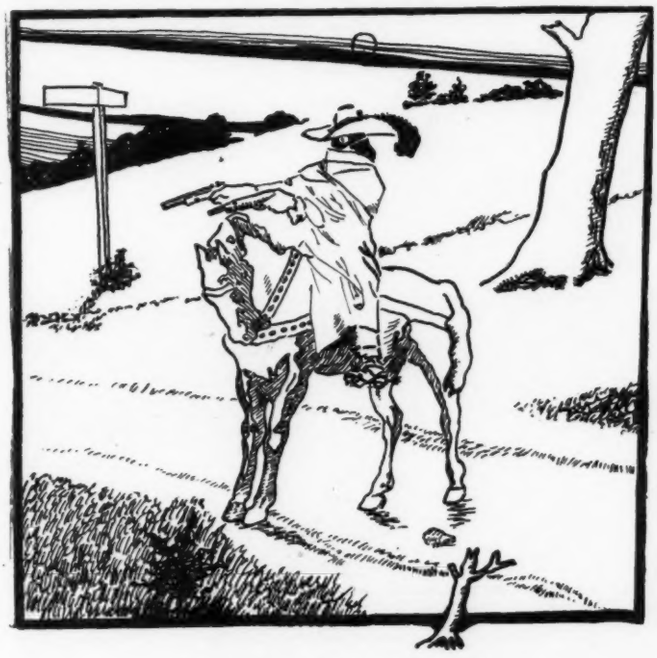
The main building is three stories in height, with basement. It is in the shape of a "T" and is made up of three wings, each 50x100 feet. The basement is occupied by the nickel-plating department, the first floor by the machine shop and rough stock room, the second floor by the assembling departments and offices and the third floor is used as pattern room and wareroom. The furnaces for hardening magnets are in a separate fireproof structure. A sprinkler system has been installed to guard against fire. The power house is in a separate fireproof building. A number of new machines have recently been placed in the machine shop, adding greatly to its capacity.

Arrangements are being made to install complete electric power transmission, doing away with belts and dust. A side track from the Nickel Plate Railroad runs into the grounds, making shipments easy. No expense has been spared to secure the best facilities for the rapid and economical execution of orders for equipment and the Williams-Abbott company announces that it is in a position to make very prompt shipments of improved telephone apparatus.

"AN ANALOGY IN GAS."

One of the very cleverest and most effective things in the advertising line that has come to the notice of TELEPHONY in some time is the illustrated folder just issued by The Controller Company of America, of Chicago, which is the sole owner and manufacturer of the Stroud telephone coin controller and other devices for measured service. The subject matter of the folder above mentioned bears upon the all-important question of measured service and is included under the general head of "An Analogy in Gas." The author is that untiring and able champion of measured service, Harold D. Stroud, and he is to be congratulated on the success of his latest effort in this line. The illustrations are unique, and being herewith presented, speak for themselves.

On the back of the folder is this original hint to the reader: "If this does not interest you, please hand it to the man who puts up the dough. P. S.—Not the baker." On the back of the cover is the "pat" quotation: "The eternal laws of equality demand measure for measure and the balance is struck in the great ledger of time." The full

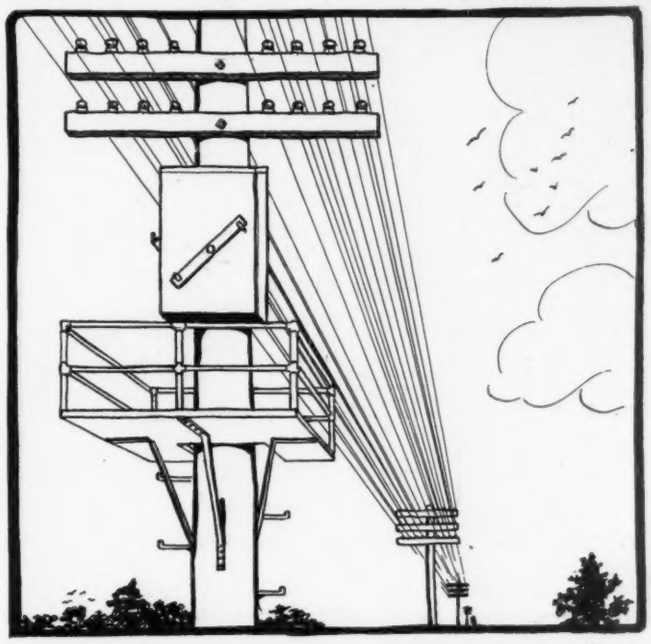


"A TIME IN FEUDAL DAYS."

text of Mr. Stroud's readable and logical "Analogy" is as follows:

"Why do you, Mr. Telephone Man, invest your money in wire, poles, conduit, and equipment? Why do you pay wages and salaries to line men, operators and managers? It is to get a good return on your investment, is it not—to make the money invested earn more money? Perhaps also you had the somewhat less sordid motive of meeting the desires of your neighbors for a more perfect service than that which was given by the old, mismanaged, indolent and indifferent organization upon which you were all-dependent at the time. While this latter reason may have influenced you at the start, the probabilities are that the money-making one was uppermost in your mind when you finally took the step. This is why you invested this money, or why you thought you were doing it at the time; but has it turned out as you expected? and if not, why not?

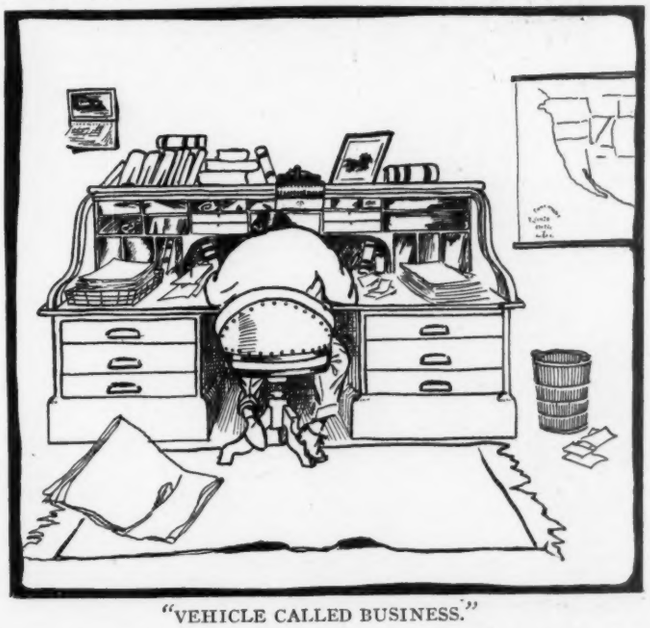
"There was a time in feudal days when some men earned their livelihood by using nerve, unlawful advantage and desperation as their conveyance on which to ride to wealth; to-day the large majority use another vehicle, called business, which varies as to the taste, opportunity, or chance of the particular individual or group. The business in which you are interested is that which deals on the one hand with poles, wires, telephones and switchboards; and on the other hand with people, called 'subscribers,' which means about the same thing as the public. For a fixed charge you grant these subscribers and their friends (again the public) the privilege of using the telephone service you furnish—



"POLES, WIRES, TELEPHONES AND SWITCHBOARDS."

that is, the privilege of transmitting spoken intelligence through your plant, and with the aid of your operators. You have given much or all of your time to the inauguration and improvement of that service, and have invested your capital.

"You started an exchange with a handful of pledged subscribers, and the prospects of getting more—how many you did not know. You figured on what it would cost to prepare for and serve the maximum number you thought would



"VEHICLE CALLED BUSINESS."

eventually employ your service, and upon these assumptions you fixed a rate that you would charge for the privilege before mentioned, and in many cases pledged yourself never to charge any more. You reasoned that the business upon which you were entering was one that in its development would obey directly the law of supply and demand—that

the more people you were called upon to serve, the more cheaply you could furnish the service.

"You reasoned illogically, that if a grocer could afford to sell a thousand pounds of sugar as cheaply per pound as he could sell ten, you could sell a million telephone calls in

"WITH PEOPLE CALLED SUBSCRIBERS."

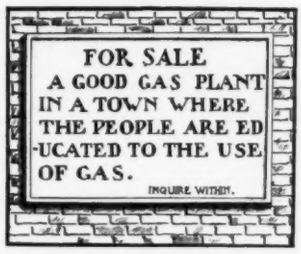
a given length of time at as good a figure per call as you could sell a thousand; either that, or you went at it blindly, not foreseeing what the outcome might be.

"You may have been like the man who, a few years ago, put in a gas plant large enough to give light to 500 families, and who gave an average of six lights to each family. He based his charges on the assumption that one or two jets would be used at a time; but when he got his plant started

"IN OTHER WORDS, MEASURE IT."

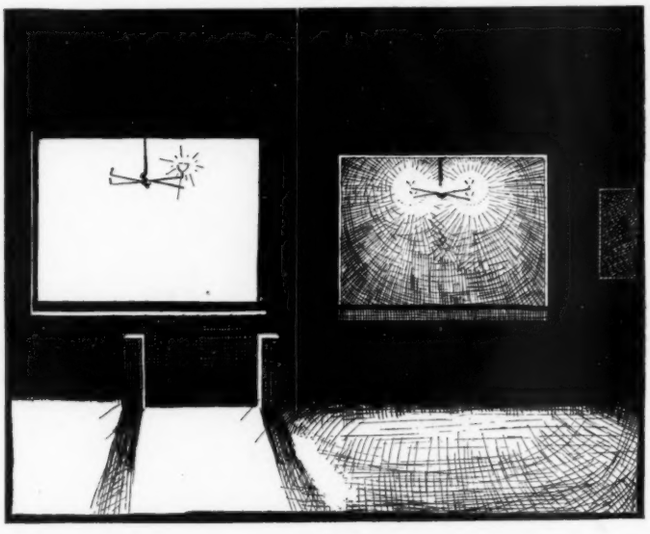
his customers all complained that the gas was poor, that there was no pressure, and consequently but little light. After a long investigation he woke up to the fact that most of the people were wasting it—burning all the jets at once, and thus pulling down the pressure. He further found what was still more important to him, that he was dishing out about three times as much gas as he figured on for the price, and he could imagine the feeling of close contact between the lower surface of his pedal extremities and the pavement.

"It is needless to say that he tried real hard to discover the error he made in his original calculations. If he had not been capable of a good deal of discernment, and worked his gray matter overtime, he would have laid the blame broadly upon the business and advertised:



"He did as many telephone investors have done, are doing, or are thinking of doing. He recalled the case of the man selling sugar, remembering that grocers do not ask you to pay one, two or three dollars per so often for the privilege of lugging away all the sugar you can carry, but weigh it—in other words, measure it. Why not, then, measure gas? The discrepancy found, our friend invested more capital in boxes for measuring the gas. Some of the people thought he should have put the money into the generating plant and larger pipes, so as to meet the demand by raising the pressure. His answer was that already the pressure was too great—but not on the pipes.

"By force of persuasion he got several hundred new



MEASURED SERVICE. UNLIMITED SERVICE.

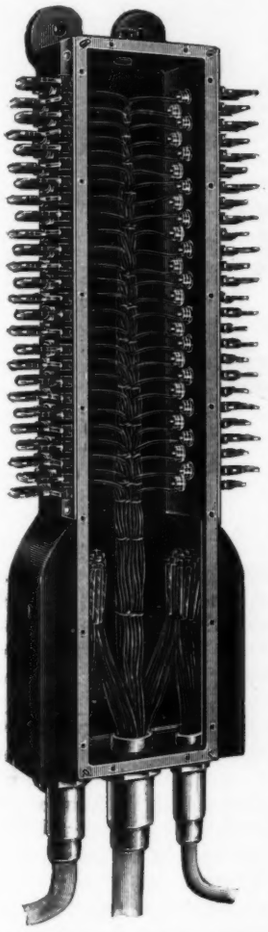
patrons to let him pipe their houses, and put in boxes to measure the gas they burned, so that each could pay for just what he used. These people did not know how bad the gas was, but thought it was better than oil. They found that by not wasting it they could have just as much light as they needed for less than the cost of oil, and less than some of the old patrons paid on the privilege plan. The word went around (as words do that relate to the pocketbook), and the majority of the old patrons begged for a chance to economize. They got it, and the pressure was relieved; the gas gave more light, and, for that reason, more people wanted it. The number of people using gas trebled before larger pipes and generators were needed, and the soles of our friend's shoes remained thicker than they might have been.

"To those who can't see a true parallel between the case

of the gas man's condition a few years ago and some of the telephone companies of to-day, this story will be continued in our next. To the man who can, all that we have to say is that we have got the boxes for the telephone man."

NEW "MOON" APPARATUS.

The study of the requirements of telephone exchanges and the anticipation of these requirements offer unlimited opportunities for the manufacturer. The Moon Manufacturing Company, Chicago, has certainly anticipated the requirements of the telephone field in its new combination terminal head and junction box, equipped with self-soldering nozzles, which is shown in the accompanying cut. Telephone engineers and managers of many exchanges throughout the country have been quick to realize the advantages of this apparatus and have at once adopted it. There was apparently a demand in advance of its manufacture.



MOON TERMINAL HEAD.

With this terminal apparatus, telephone cable may be installed without making sleeve splices, splicing on rubber insulated cable, or forming "wipe joints." No further statement should be required to show the economy in using this apparatus. The workman of ordinary ability may install it and form the cable splices. It is not necessary to employ labor skilled in that particular branch of work. The accompanying cut, together with the diagram, shows so clearly the manner in which this apparatus is to be used that it need not be described in detail.

The Moon combination terminal head and junction box, together with its metal outer case or storm box, is first fastened permanently on the pole. The cables are then run in. The lead sheath of the cable is sealed to the self-soldering nozzle by simply heating the nozzle with a blow torch. After this work has been performed, one can readily understand that the matter of forming the cable splice is very easily accomplished. This form of apparatus would not be practical to install if it were not for the Moon self-soldering nozzle, which is the key to its successful installation. With the old manner of forming sleeve splices, the joining of two or three cables together was so complicated a piece of work that it was necessary to employ expert labor, and at best it was a slow and expensive job.

This Moon apparatus is made in various sizes, to distribute any number of cable wires which may be required, and for any combination of cable. Where it is desirable to distribute large cable to six and ten-party lines, a combination terminal head and junction box is well adapted for this purpose. A 100-pair cable enters the ten-pair head, and distributes ten pair of cable wires to the terminal connections. The same size of cable extends to each succeeding head until a sufficient number of wires have been distributed to warrant continuing from the last head with a smaller size of cable. As many of the connections of the ten-pair heads are placed in multiple as may be desired.

With the use of this apparatus, it is possible for the smaller exchanges to adopt the most economical plan of distributing cable which is in common use in all of the large plants, namely, to extend from the exchange with a main lead of cable, with branches of smaller cables continuing to various points, in the manner indicated in the diagram.

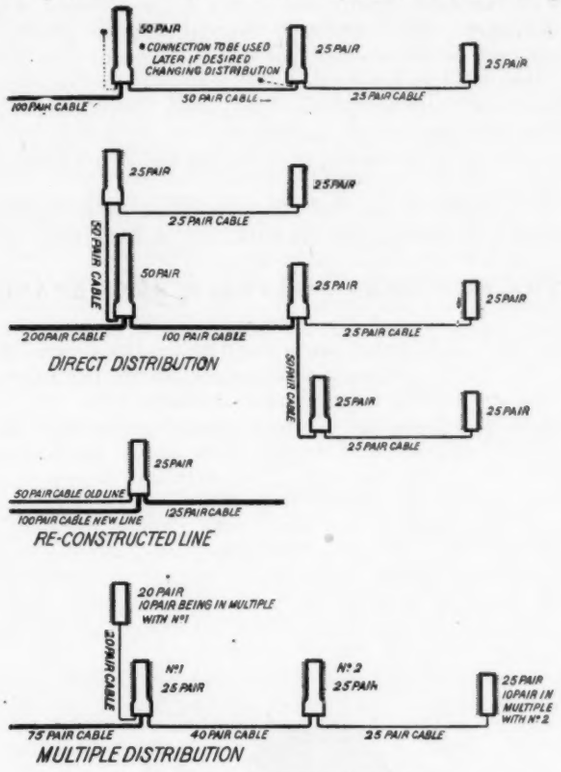


DIAGRAM OF DISTRIBUTION.

One of the best features of this apparatus is the facility afforded for testing any one of the cables entering the head, or for re-arranging the distribution of the cable wires.

SWAMPED WITH PROTECTOR ORDERS.

The American Electric Fuse Company of Chicago, New York and Atlanta, reports a large number of new orders for Kaisling self-soldering protectors. During November orders were received for about 20,000 pairs and the American company has had to increase its factory equipment more than 100 per cent to take care of the rapid growth in this business.

Mr. Kaisling, inventor of the Kaisling protector, has perfected a number of new designs in protective apparatus, which will shortly be placed upon the market by the American Electric Fuse Company, which has an exclusive contract with Mr. Kaisling for all of his protective inventions.

The American Electric Fuse Company also states that its general trade in fuses, fuse blocks, connectors and other specialties has been very good during the past month and that the company's factory has worked overtime to fill orders.

BIG DEMAND FOR ADJUSTAPHONES.

The Chicago Writing Machine Company, Chicago, has recently doubled the capacity of its manufacturing plant.

It has added considerable new machinery, including a full complement of new adjustaphone tools, dies, etc., and the company takes pleasure in announcing that it is now prepared to handle orders of any magnitude, quickly and satisfactorily.

The phenomenal sale of this apparatus and the universal approval and satisfaction that it has met with by telephone

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companies throughout the country, indicates that the adjustaphone is a most profitable investment. The manufacturers claim that this apparatus has long since passed the experimental stage, and although only a little over a year on the market, has been standardized and adopted by thousands of telephone companies in the United States, Canada and Europe. The efficiency, durability and greatly decreased cost of maintenance of this instrument over the old style desk set has been fully demonstrated by constant and severe tests, and telephone companies contemplating installing new apparatus, improving or replacing defective and worn-out instruments, should give the adjustaphone due consideration.

The company is making an exceptional offer on this instrument and will be glad to send one on free trial.

THE NEW DEAN PORTABLE DESK STAND.

The new desk stand manufactured by the Dean Electric Company, Elyria, Ohio, is a radical departure from the time-honored and inefficient method of construction. It is made in the most substantial manner possible, the inner framework being pressed and drawn from heavy sheet steel, instead of the usual castings. The external design is along graceful and simple lines, while the finish is beautiful and lasting. The upright is covered with a thick, polished, hard rubber tube, and all of the remaining exposed portions are heavily nickel-plated. This hard rubber covering of the tubular upright does away with the unsightly wear and tarnish caused by handling, which all comes on this part of the stand.

The hook switch is one of the most novel features of the Dean desk stand. The contact springs, which are the same

NEW DEAN PORTABLE DESK STAND.

as those used in the standard Dean hook switch, are mounted edgewise within the base so that the platinum contact points are open for inspection by simply removing the base covering. The motion of the hook proper is transmitted to the contact springs by a simple intermediate lever, which, together with its actuating or main spring, is mounted on a steel frame. This steel frame is locked in place within the upright tube by a spring catch, which can be released from the bottom of the stand when the base cover is removed. The transmitter is mounted on the top of this steel frame and its circuit carried to spring contacts within the base, thus allowing the entire mechanism concealed within the upright to be removed without disturbing the wiring. The base cover is held in place by a bayonet lock and spring catch, thereby making it possible to quickly open up the stand so as to get at all of the working parts without the use of tools, as shown in Fig. 2. The cushion protection, provided on the bottom of the stand, is left in place after the base cover is removed, so that there is no danger of marring the desk woodwork—a common occurence with some makes of stands.

An entirely new feature incorporated in the Dean desk stand, which will make this instrument of double value in the interchangeable circuit plate, is that all of the talking circuit apparatus, excepting the transmitter and receiver, is mounted on a metal plate and completely wired so as to form a unit, as shown in Fig. 3. These units are interchangeable and are arranged for local battery and common battery circuits, the remainder of the desk stand, excepting the transmitter, being the same for both services. Thus in making a change, it is only necessary to replace the cir-

NEW DEAN PORTABLE DESK STAND.

cuit plate with the one containing the desired new circuit. Special tools are not necessary, as the plates are complete in themselves and are held in place by three screws. Exchanges contemplating a change from local to common battery at any future time will fully appreciate this new feature.

All of the parts entering into the circuit of the Dean desk stand are concealed and thoroughly insulated, so that there is no chance for the subscriber to receive a shock while using the instrument. The steel framework and other parts subject to corrosion are carefully plated with copper. The base is provided with a nickel-plated, heavy brass covering, which will not become dented by severe use.

The new Dean "balanced Wheatstone bridge type," common battery talking circuit, is especially adapted for mounting in a desk stand, as, outside of the transmitter and receiver, it contains only a single coil. The hook switch has only one contact, while the cord necessary to connect the stand to the desk set box requires only two conductors. All of the circuit apparatus excepting the transmitter and receiver are mounted on a circuit plate, as shown in Fig 3, which is interchangeable with the local battery circuit plate. The use of a one-point hook switch and a two-conductor cord reduces the maintenance of this stand to a minimum. The local battery or magneto stand is similarly arranged, with the induction coil and contact springs mounted on a circuit plate, which is interchangeable with that of the common battery stand.

The bell box used with the common battery stand is made from pressed steel with an enamel finish. It contains only the signaling apparatus, consisting of a ringer and condenser, as all of the talking apparatus is located in the stand. The magneto bell box is made from quartered oak or walnut and contains the ringer and generator.

This new line of Dean apparatus has caused considerable favorable comment throughout the country and is destined to make the portable desk telephone more popular than ever, especially with telephone companies upon which the maintenance falls.

TRIO OF WIDE-AWAKE TELEPHONE ENGINEERS.

Ray H. Manson was graduated from the University of Maine, class of '98, and later received the degree of electrical engineer from the same institution. He accepted a position with the Western Electric Company of Chicago in 1899 and after about two years of work in its factory, shop, office and telephone laboratory, he took a position with the Kellogg Switchboard and Supply Company, as assistant to W. W. Dean in the experimental laboratory. Later he served in its engineering department, and as sales engineer.

RAY H. MANSON.

When the Dean Electric Company was formed, Mr. Manson accepted a position as assistant to Mr. Dean in engineering and experimental work. He is associate member of the American Institute of Electrical Engineers.

Sidney A. Beyland was graduated from the University of Tennessee, class of '95, in electrical and mechanical engineering. After graduating he was associated with the telephone interests in Knoxville, Tennessee, and Bristol, Virginia. He came to Chicago in 1899 to accept a position in the drafting room of the Western Electric Company. In six months he was assigned to the post of "checker" for the telephone department. Later he was given charge of the circuit and cabling work, and afterward was placed in charge of the entire telephone department of the drafting room. He held this position but a short time, when he resigned to accept a position with the Kellogg Switchboard and Supply Company in its engineering department, in charge of circuit and cabling work. He was later assigned as assistant to Mr. Dean on apparatus design. When the Dean Electric Company was organized the first of the year, he accepted an offer from Mr. Dean to take charge of the switchboard engineering work.

SIDNEY A. BEYLAND.

Albion D. T. Libby was graduated from the University of Maine, class of '98, and later received the degree of electrical engineer from the same institution. He accepted a position with the Western Electric Company of Chicago in 1899, and after about two years in its factory, telephone laboratory, installing department and engineering department, he accepted a position with the Kellogg Switchboard and Supply Company to take charge of power equipment engineering. He remained four years with the Kellogg company, designing all its power equipment, which included much original work. Mr. Libby is responsible for the first good power plants in the Independent field, having taken the initiative in bringing the power end of the modern central battery exchange on a par with the remainder of the exchange equipment.

ALBION D. T. LIBBY.

He accepted the position of power engineer and chief installer of the Dean Electric Company in October of this year, having worked under Mr. Dean in the Western Electric Company's laboratory.

Mr. Libby is associate member of the American Institute of Electrical Engineers.

DEVICE TO CHANGE SYSTEM.

The International Telephone Manufacturing Company, Chicago, it is said, has devised a system which enables it to build its regular self-restoring drop magneto switchboard in such a manner that the system may be used originally as a generator-call local battery plant and changed at any time into a strictly central energy system, by simply adding the necessary central office battery or power plant.

Changing from generator-call to central energy, does not require discarding any part of the central office apparatus. This enables telephone companies, when rebuilding small generator-call plants, to first put in the necessary switchboard, and later, at any time, to install the power plant and make the necessary changes in the telephones, and ultimately have a complete central energy system without discarding any of the apparatus installed of this make.

INDEPENDENT TELEPHONE SECURITIES CO.

The Independent Telephone Securities Company has been incorporated at Utica, New York. The object of the proposed corporation is to purchase the stock and bonds of Independent telephone companies and to hold a controlling interest in these companies, improving the service and strengthening the different local plants. The company will have a capital stock of $800,000 and an authorized bond issue of $15,000,000. Its home office will be in Utica, and the directors are Thomas W. Finucane, of Rochester; Frederick W. Zoller, of Rochester; George R. Fuller, of Rochester; Charles H. Poole and T. H. Ferris, of Utica. The company will have in its treasury securities amounting to $428,000, representing the control of the Utica Home Telephone Company, the County Telephone Company of Herkimer, and the Otsego Home Telephone Company.

NEW FACTORY FOR AMERICAN ELECTRIC TELEPHONE COMPANY.

The American Electric Telephone Company has purchased a tract of land comprising about twelve acres, located at 64th and State streets, Chicago, upon which it will erect a modern telephone and switchboard factory for the manufacture of all kinds of electrical equipment.

The building and power plant will be of the most modern and approved construction and will embody all of the latest ideas that have developed in this line.

The factory will be built of vitrified brick, having two-story and basement frontage on State street and extending east, with one-story saw-tooth roof brick building.

Messrs. Nimmons & Fellows are the architects, and the general contract has been given to Jacob Rhodatz, one of the most reliable contractors in the city.

The work of excavation and building was commenced some time ago, and the factory will be ready for occupancy April 1, 1905.

An excellent method of preserving all poles, which is of so much importance to the exchange manager who is endeavoring to preserve an old, decayed line, is announced by the C. A. Manufacturing Company of Austin, Texas. The preservative appears, as would naturally be expected, to be a creosote compound. It is to be applied by excavating a hole a few inches from the base of the pole where it enters the ground and thoroughly saturating the pole with the compound, which it is well to work in with a brush. It is stated that this treatment will repair decay to a very marked degree.

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FRANK B. COOK offers an interesting advertisement in this issue of TELEPHONY which shows, without descriptive matter, the line of protective apparatus which he makes.

E. E. KNOX, general manager of the Portsmouth (Ohio) Telephone Company, has leased two floors of a large building in Portsmouth, and will at once take steps to organize a company to manufacture a newly patented selective telephone on which he has the exclusive right.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Chicago, has the contract for the equipment of the new exchange of Dixon (Ill.) Home Telephone Company, and has ordered the Kaisling protector for the main office. The initial installation is 1,000 pairs.

THE AMERICAN INSULATED WIRE AND CABLE COMPANY, Chicago, has been purchased by a new company, with which Muncie, Indiana, capitalists are prominently identified. The factory will be removed to Muncie and greatly enlarged. An office will be maintained in Chicago.

THE AMERICAN STEEL AND WIRE COMPANY, with offices in New York, Chicago and nearly every other important city in the country, has just issued another illustrated folder, descriptive of the leading varieties of wire rope it manufactures, which will be sent to any one upon application.

THE EUREKA ELECTRIC COMPANY reports the sale of a number of new automatic exchanges. The Eureka automatic apparatus is said to be admirably adapted to exchanges having a capacity up to 300 lines, and is reported to be giving excellent satisfaction wherever installed.

THE WILLIAMS TELEPHONE AND SUPPLY COMPANY, Cleveland, Ohio, reports a decided improvement in trade conditions. Its recent removal into new and better quarters, with equipment which enables it to turn out the very best quality of goods in the least possible time, is effectively bearing fruit.

THE STANDARD TELEPHONE AND ELECTRIC COMPANY, Milwaukee, is manufacturing a handsome new desk set, No. 147, for which it claims simplicity, durability, accessibility, compactness and strength. It will be sold to manufacturers, as well as to customers in general. Full information and prices on application.

HUBBARD & COMPANY, Pittsburg, call the attention of the trade to their all-iron pole seats. These seats are made in the most substantial manner, the rim and braces being of angle iron, and the cross bars of stiff steel, solidly riveted to the rim. They are finished either japanned or black. Prices upon application. This firm also manufactures braces, pole steps, anchor rods, etc.

THE AMERICAN ELECTRIC FUSE COMPANY, Chicago and New York, is sending out an advertising conceit that is at once so pretty and fascinating that it would awaken the attention of even a wooden man. It is a photographic reproduction of a coquettish and most fascinating young lady in soubrette attire, who smiles as she exposes to view a glimpse of lingerie, et cetera. At the fair creature's side is printed "Kaisling Self-Soldering Protector," but whether this is her name or just a friend of hers is not stated. Anyway, the picture is as refreshing as a June breeze from a peach orchard.

THE CONNECTICUT TELEPHONE AND ELECTRIC COMPANY, Meridien, Conn., reports large sales of its weatherproof iron box telephone, which is especially designed for mine, street railway and police systems. The company will send its large and new catalogue, which is profusely illustrated with telephone material, upon request.

THE HARVARD ELECTRIC COMPANY, Chicago, has just issued a new catalogue and price list—No. 14—descriptive of the extensive line of electrical goods it manufactures, and in which will be found much to interest those engaged in the telephone business. The catalogue is of the "handy pocket size" and will be mailed upon request.

THE F. BISSELL COMPANY, Toledo, Ohio, has issued Supplement No. 1 to Bulletin No. 33, which treats of novelty potheads, sleeves and branches, Security paper insulators and pothead brackets, American wire joints, and other supplies for use in telephone construction work. The supplement is illustrated and will be sent upon request.

THE SWEDISH-AMERICAN TELEPHONE COMPANY, Chicago, has issued a unique folding illustrated circular descriptive of its non-interfering telephones, rural exchange switchboards, lightning arresters, etc., paying particular attention to its Hercules No. 99 bridging telephone, which is shown in an immense illustration and by diagrams.

THE CENTURY TELEPHONE CONSTRUCTION COMPANY, Buffalo, New York, has recently perfected an outside cable terminal head which should prove a boon to telephone exchanges. This cable head is moderate in price, and is mechanically and electrically entirely practical. An illustrated booklet will be furnished to interested persons upon request.

THE World's Fair international jury in Group III, higher education, technical schools, etc., has awarded a bronze medal to the Thomas S. Clarkson Memorial School of Technology at Potsdam, New York. The exhibit of this school was warmly commended by the members of the jury, and has been a source of interest to visitors throughout the fair.

THE INDEPENDENT TELEPHONE MANUFACTURING COMPANY, Madison, Wisconsin, has just issued a new bulletin, which is made on the loose-leaf plan, each leaf containing a description and illustration of a separate article. In order to change the reading matter or illustration concerning any one article, all that is necessary is to insert a new leaf. The Independent Telephone Manufacturing Company was organized by L. W. Burch of the Electric Supply Company and H. E. Beister, formerly an employe of the Standard Telephone Company of Milwaukee. Mr. Burch is the general manager.

INDEPENDENT telephone companies are rapidly coming to the conclusion that a great deal of revenue may be derived through operating private branch exchanges in certain localities. An instance of this is shown by the recent equipment shipped to the Topeka Independent Telephone and Telegraph Company of Topeka, Kansas. This calls for a private branch exchange equipment for installation in the high school at Topeka. The subscribers' lines for private branch exchanges are supplied with current from a local installation of dry batteries, this plan having been thought the most economical one by the Topeka company. The equipment further consists of complete arrangement for incoming and outgoing trunk circuits. The switchboard

was built by the American Electric Telephone Company of Chicago.

THE CHICAGO TELEPHONE SUPPLY COMPANY, Elkhart, Indiana, has issued a striking mailing card, calling attention to the fact that its Catalogue No. 45, showing all the 1905 models, is now ready for distribution. This catalogue is a voluminous and beautiful one and has been fully described in this department. It will be sent without charge to all who write for it.

"CURRENT GOSSIP" is the title of an attractive little booklet just issued by the Edmonstone Company, New York city, manufacturer of the Anders push-button telephone. It contains a detailed description of this unique telephone, embellished with numerous illustrations. The Edmonstone Company will be pleased to send one of these booklets to anyone making request for same.

FRANK B. COOK, Chicago, recently has made several additions to his line, and is now carrying a full assortment of construction material, on which he is quoting some attractive prices. He is preparing a new catalogue, which will include, among other things, marlin cable hangers, anchors, messenger hangers, pole steps, insulators, cross arm braces, insulator jackets, brackets and wooden pins.

THE DEAN ELECTRIC COMPANY, Elyria, Ohio, has found it necessary to make an extensive addition to its shop to accommodate its increasing business. This new company only commenced to make quantity shipments of apparatus in August, but already has a large established business. The Dean company has adopted the most modern shop methods, which insures quick deliveries of its standard output.

THE B-R ELECTRIC AND TELEPHONE MANUFACTURING COMPANY, Kansas City, Missouri, announces that its telephone catalogue No. 5 is now ready for distribution. It is a volume of 128 pages, fully illustrated, and describes in full the complete line of B-R telephones and supplies, which cover a wide field. Catalogue and list of prices will be mailed upon request to any one engaged in telephone work.

THE OHIO VALLEY GLASS COMPANY has been so favored with telephone business during the past couple of months that the firm has been compelled to run night and day to fill orders, and is still behind the demand. H. E. Cobb, 1501 Monadnock block, Chicago, is the general sales agent for this concern, and it is very gratifying to know that Mr. Cobb's company, as well as its product and his popular business methods, are meeting with success.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, which is rebuilding the Public Service Telephone Exchange for the municipality of Neepawa, Manitoba, Canada, has secured, in addition to its contract for central office equipment, an order for subscribers' telephones, replacing those formerly in use. When the exchange is completed it will be fully equipped with International apparatus, replacing equipment made in France.

THE DEAN ELECTRIC COMPANY, Elyria, Ohio, has just issued the second of its series of little booklets on telephone apparatus. The present edition treats of "Complete Telephones" for both magneto and central battery systems. The various new parts which go to make up these telephones are fully illustrated and described. Several circuits are also shown to explain the merits of their balanced Wheatstone bridge central battery telephone circuit. This circuit is claimed to have many important advantages, not possible in other commercial circuits now on the market, and its extreme simplicity should render the chances for trouble practically nothing.

THE EUREKA ELECTRIC COMPANY, Chicago and Genoa, Illinois, has ready for distribution Catalogue No. 33, fully describing its switchboards, telephones and other well-known apparatus. The catalogue is neatly gotten up and profusely illustrated, and will prove of interest to anyone engaged in the telephone work, especially those who are contemplating exchange construction. A request to the Eureka company for this catalogue will bring one in your mail.

THE INDEPENDENT DRY BATTERY COMPANY is the name of a new concern which has just started business at 185 Jackson boulevard, Chicago. It will manufacture a high grade of dry batteries for both local and long-distance Independent telephone companies, and invites correspondence from all those who contemplate the purchase of dry batteries. The "ad" of this company, appearing on another page, explains more fully the nature of the product manufactured.

THE ACME ELECTRIC AND TELEPHONE COMPANY, which has been thoroughly reorganized, and is now in the hands of reliable and experienced telephone men, has secured new quarters at 69 to 75 West Jackson boulevard, Chicago, where it will enjoy up-to-date facilities for turning out first-class apparatus. The Acme's line of telephones has been so developed as to meet every requirement of the trade. The company will be pleased to send its bulletins and other circular matter to all parties interested.

THE FIBRE CONDUIT COMPANY, Orangeburg, New York, through its western representative, W. W. Smythe, 1760 Monadnock building, Chicago, has recently secured a number of good-sized contracts, among which may be mentioned 100,000 feet of fibre conduit for the new telephone company at Green Bay, Wisconsin; 100,000 feet for Sioux City, Iowa; 30,000 feet for LaPorte, Indiana; 75,000 feet for Grand Rapids, Indiana, and 100,000 feet for the Merchants' Heat and Light Company of Indianapolis.

THE NATIONAL CONDUIT AND CABLE COMPANY, 41 Park Row, New York city, manufacturer of bare copper wire, weatherproof wires and cables, lead-covered wires and cables for telephone, telegraph, electric light and power work, has issued "Copper Gossip" for November. This bulletin considers the outlook for business more encouraging. Copper for weeks has gradually been improving, and the prices are now the highest since the month of May. Large sales have been made within the last three weeks, but principally for export.

THE GRAY TELEPHONE PAY STATION COMPANY, Hartford, Connecticut, is responsible for a clever piece of booklet advertising. It is cut and printed to represent a small book, entitled, "The Book of Public and Measured Telephone Service Equipment." Within is described the Gray automatic and semi-automatic telephone toll collector in all the various forms. A large number and variety of illustrations aid in making the little book still more interesting. A request for this novel catalogue will be cheerfully and promptly complied with.

M. E. MCKIM, one of the best-known telephone supply men in Missouri, recently opened, at 119 North Eighth street, St. Joseph, Missouri, an office and salesroom for telephones, telephone supplies, electrical novelties, flashlights and batteries. Mr. McKim will not only maintain an office and salesroom at the above address, but expects to be on the road considerable of his time, calling upon the trade,

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with whom he has had such close relations in the past. It is predicted that Mr. McKim will enjoy a good share of western patronage.

THE TOPEKA INDEPENDENT TELEPHONE COMPANY of Topeka, Kansas, since its organization in 1901 has experienced a remarkable increase in business. Since the original installation it has been necessary to increase the capacity at least once every nine months. The American Electric Telephone Company, which furnished the original equipment and additional increases, has just completed the construction of another section of switchboard for the Topeka exchange. The Topeka company is now giving service to 2,500 subscribers.

THE FARR TELEPHONE AND CONSTRUCTION SUPPLY COMPANY, Chicago, has ready for distribution Catalogue No. 17, an illustrated book of information upon its telephones, switchboards and general line of telephone supplies. A trade discount sheet is also included in the catalogue. At the close of the book is a fully illustrated article on "How to Build Farmers' Lines," which will be of great interest to those contemplating building rural exchanges. The catalogue contains also much other interesting information along telephonic lines. A request for Catalogue No. 17 will bring one in the next mail.

ONE of the new things in the telephone field, of a higher practical nature, is the Harter ringing transformer, invented by M. S. Harter and manufactured by the Current Electric Company, 52 State street, Chicago. This device will transform a forty-volt battery current to eighty volts for alternating or direct pulsating current ringing, with only thirty dry cells required. The battery remains on open circuit except when operator is ringing, hence effecting a great saving. The company offers a strong guaranty as to the efficiency of this new apparatus and will send it to prospective customers on ten days' trial.

THE DE VEAU TELEPHONE MANUFACTURING COMPANY, New York city, has recently closed the following contracts for complete installations: Two schools in Buffalo; two schools in New York city; one central energy outfit for St. John, New Brunswick, Canada; one complete hotel equipment for Ottawa, Ontario, Canada; one complete hotel equipment for Norfolk, Virginia; one complete central energy plant for the Panama Railway Company, Panama; one complete central energy plant for Mexico; one complete system for the capitol, Albany, New York; a large shipment of telephone apparatus to San Francisco.

THE AMERICAN ELECTRIC FUSE COMPANY announces that it has made a number of improvements in connection with its general line of protective apparatus, and that it now has a larger and better stock of its standard American specialties than ever before. Every effort has been made with the object in view of improving the quality of the goods, without increasing the cost. It will no doubt be advantageous to those interested in protectors of all kinds to write the American Electric Fuse Company for information and prices. A new catalogue will be issued within the next two weeks, which, it is said, will be most attractive.

THE CONTROLLER COMPANY OF AMERICA entertained the representatives of a number of the World's Fair electrical exhibiting firms on a trolley-car ride, November 10, over one of the suburban lines west of St. Louis. A. H. Stroud was in charge of the private car "Mabel," owned by E. G. Lewis, secretary of the Controller company, and which was used on this occasion. The guests expressed themselves as delighted with the ride and the hospitality of the Controller company. A recent visitor to the measured service booth of the Controller company at the World's Fair was Vice-President-elect Fairbanks, who inquired into the workings of the measured service devices used, and was so interested in the exhibit that he begged the privilege of using a controller, "to see how it worked." He talked with several friends on the grounds and expressed himself as highly pleased with the results obtained.

W. N. MATTHEWS & BROTHER, St. Louis, manufacturers of the well-known Stombaugh guy anchors, recently received an order from J. E. Overstreet, general contractor, St. Louis, for 180 eight and ten-inch Stombaugh anchors, to be used at each of the four DeForest wireless telegraph stations of the United States navy at Key West, Florida; Guantanamo, Cuba; San Juan, Porto Rico, and Colon, Panama. Mr. Overstreet is a government contractor, and in May last used eight of the Stombaugh anchors for guying purposes in connection with the erection of the DeForest wireless telegraph mast on the World's Fair grounds at St. Louis. He says of the Stombaugh anchor, "They have given me entire satisfaction." His letter in full, in which he ordered 180 anchors, appears in the advertisement of Matthews & Brother on another page, and any one interested in the question of anchors should read it.

RAPID TELEPHONE CONSTRUCTION.

J. A. Driscoll, the recently elected president and general manager of the Wayne County (New York) Telephone Company and of the Wayne & Monroe Telephone Company, recently accomplished one of the greatest feats in the history of rural telephone line building, in connecting two lines by building a line from Lyons to Sodus in one week. On the Tuesday before election Mr. Driscoll conceived the idea that it would be advantageous to the patrons of both lines if they could be connected in order to receive the election news. The directors thought it impossible, as it required the building of seventeen miles of line, with no material on hand. Mr. Driscoll, however, started gangs out digging holes from Sodus to Lyons, the poles reaching Sodus on Thursday and Lyons on Saturday. The men worked day and night, all day Sunday and up to Monday, when the line was completed. The combined companies now have a complete system radiating from Lyons, which will be the central station, lines running from that place all over Wayne and adjoining counties, affording every hamlet and farmer a chance to be connected up with not alone the county seat of Wayne county, but also with Rochester, Syracuse and Independent companies in Ontario, Seneca, Cayuga, Jefferson, Oswego, St. Lawrence and the counties in the Black River district.

TELEPHONES FROM PULPIT TO PEW.

Officials of the Congregational church of Sherburne, New York, have sanctioned the installation in the pews of a telephone system by which they hope to have the people of the congregation who are hard of hearing enjoy the sermons as well as the rest.

Fred I. Shepard, general manager of the telephone company at Sherburne, is spending his spare time perfecting the system, connecting each of the pews with a line running directly to the pulpit. He will place a specially constructed transmitter near the preacher's head so that his remarks will be caught by it and not be interrupted in their usual course. Small receivers that can be concealed in the hand will be placed in the pews.

A large number of the congregation cannot hear sufficiently to follow the sermons, and as a result many have ceased attending the services. The church people are elated with the prospect of again being able to attend services and hear the sermons.

PERSONAL

William Kroatter has completed an automatic telephone system in Spencer, Iowa.

Damon Graptorex is now superintendent of the Hartford (N. D.) telephone line.

J. Moore has been granted a franchise for a telephone system at Glasgow, Montana.

W. B. Bascom has commenced rebuilding the telephone system at Harvey, North Dakota.

F. P. Linder has purchased the Hartwell, Georgia, telephone exchange of L. M. Pelton.

L. M. Brooks has been granted a franchise to put in a telephone system at Erick, Oklahoma.

O. I. Anderson is making extensive repairs on his telephone system at Colfax, Wisconsin.

Paul Crews will establish a telephone system connecting Buda, Texas, with surrounding towns.

Emmet Henderson and others have completed the new telephone system at Waitsburg, Washington.

J. J. Greaves of Glencoe is establishing a local telephone exchange at Silver Lake, Minnesota.

Horace Cavanaugh has resigned as manager of the Mutual Telephone Company, at Alpena, Michigan.

C. W. Bartlett and son, Carl, have purchased an interest in the Fairbury (Neb.) Telephone Company.

Frank Crippen has been appointed manager of the Mutual Telephone Company's system at Alpena, Michigan.

Silas Lake, manager of the Lewis County (Ill.) Telephone Company, has taken up his residence at La Grange.

Messrs. Dalby & Anderson have petitioned the city council of Marysville, California, for a telephone franchise.

T. A. Jack has been placed in charge of the Minnesota Central Telephone Company at Park Rapids, Minnesota.

Chester Smith has purchased of C. H. Widener the telephone exchange and franchise at Blue Mound, Kansas.

E. P. Baird of the Baird Manufacturing Company, Chicago, recently visited the western slope on a business trip.

A. B. Benton is preparing plans for the telephone exchange of the Home Telephone Company at Redlands, California.

Manager Yenser of the La Cygne (Kan.) telephone exchange has purchased the Pleasanton exchange from Fred Ernst.

M. R. Nyman, formerly connected with the telephone press of Chicago, is now with the Baird Manufacturing Company.

Robert Ross of the Ross Telephone Company of Hebron, Indiana, was in Chicago recently, ordering more telephones.

R. H. Sliter has been granted a franchise and has begun the construction of a telephone line at Gray Eagle, Minnesota.

Alex Williams has been appointed general manager of the Minnesota Central Telephone Company at Willmar, Minnesota.

O. P. Pierson has been granted a franchise for right of way to construct telephone lines in Lincoln county, New Mexico.

G. W. Colton has been appointed manager for the United Telephone and Telegraph Company at Lewisburg, Pennsylvania.

John K. Norstrom of the Automatic Telephone Company, Chicago, recently made a trip to St. Louis and the World's Fair.

A. C. Branum has been delegated by the Belmont Telephone Company to establish an exchange at Bethesda, West Virginia.

J. Sebastian, an official of the Rock Island Railroad, is endeavoring to have a telephone factory moved to Des Moines, Iowa.

W. N. Curtis of Milton, Iowa, has been engaged by the Hyde County (S. D.) Telephone Company to install its new exchange.

Tony Klunder, one of E. R. Harding's able lieutenants at the Chicago office of the Holtzer-Cabot Company, is ill with typhoid fever.

W. A. Conklin is having an upper story put on his business house at Table Rock, Nebraska, to use for a telephone central office.

C. W. Roberts, manager of the Roberts Telephone and Electric Company of Abilene, Texas, paid a visit to the World's Fair last month.

A. F. Stearns, C. L. Beckley and E. M. Brooks have been appointed by the Oakland Development League of Oakland, Oregon, to solicit subscriptions for installing a telephone system in that city.

H. E. Procunier of the Moon Manufacturing Company, Chicago, made a business trip to Colorado and other western points last month.

H. M. Joy of Phoenix, Arizona, is in the east on business connected with the telephone system which he expects to install at Phoenix.

W. E. Caldwell is promoting a telephone line which will connect Alice and Fulfurrias, Texas, and probably the ranches in the lower country.

President Olsen of the Viborg & Centerpoint Telephone Company at Viborg, South Dakota, made a business trip to Chicago the latter part of October.

Dr. C. C. Cady and Otto F. Unz of Harris, Iowa, have formed a partnership for the erection of a rural telephone line to connect with the Harris exchange.

T. M. Deacy has sold the telephone system at Excelsior Springs, Missouri, to W. H. Titus, president of the Clay County State Bank, for a consideration of $20,000.

Henry Graif has sold his local telephone system in Lake Crystal, Minnesota, to the Blue Earth County Telephone Company for $6,100, possession to be given December 1.

Paul H. Jeardeau of Benhoff, North Dakota, contemplates the construction of a telephone line from Benhoff to Washington, with branches to Harvey and Goodrich.

T. A. Montgomery, superintendent of the Roebling Construction Company of Chicago, is superintending the fire proofing of the Sioux City (Iowa) company's new building.

Don Gould will represent the Stromberg-Carlson Telephone Manufacturing Company in Nebraska and Colorado, having opened an office at Lincoln, Nebraska, November 10.

W. A. Porter has resigned as manager of the Independent telephone exchange at Waxahachie, Texas, and is succeeded by Tony Schafer, formerly exchange manager at Ennis.

President G. A. Starrett of the Commercial Club of Sheldon, Iowa, has petitioned the city council for a franchise for the construction of an Independent telephone system.

Eugene F. Edmunds has been appointed manager of the Marshall (Mich.) Telephone Company, which is now a part of the Citizens' Telephone Company of Grand Rapids.

F. L. Van Almen has been appointed manager for the Fox River Valley Telephone Company at Appleton, Wisconsin, vice F. S. Green, who resigned to go to Los Angeles.

F. G. Dickerson, president of the Kester Electric Company, Chicago, recently visited St. Louis, looking after the company's World's Fair exhibit and various other interests there.

A. D. Gillespie, who has been making Monarch wire and supplies popular throughout Indiana and Ohio, is expected back in Chicago to attend the Interstate convention in December.

W. W. Main of Elk Point, South Dakota, has closed a deal with Michael Ryan whereby he comes into possession of all of Mr. Ryan's interest in the Elk Point telephone plant and franchise.

H. L. Reber, general manager of the Kinloch Telephone Company of St. Louis, visited the Citizens' Telephone Company of Grand Rapids, Michigan, recently to inspect the automatic system in use there.

Ed G. Hammer, secretary of the Wanamingo-Farmers' Mutual Telephone Company, at Zumbrota, Minnesota, recently made a trip to Chicago and St. Louis. His system is to be immediately enlarged.

R. O. Brush of Middleport, New York, has been appointed manager for the Home Telephone Company's system at Batavia, New York, to succeed J. C. Burton, who takes charge of the system at Dunkirk.

J. E. Baumrucker is now connected with the Chicago Writing Machine Company of Chicago, having been placed in charge of the sales department devoted to adjustaphones and the Chicago telephone holder.

J. W. Benson, stenographer for the International Telephone Company at Springfield, Illinois, has resigned his position and gone to Washington, D. C., where he has a position with the civil service commission.

D. M. Neill has been granted a franchise for a competing local exchange at Red Wing, Minnesota. He will connect with the Consolidated Telephone Company's long-distance line and will also build rural lines.

Frank M. Fish, John K. Fish and G. W. Whitehead have incorporated the Badger Telephone and Telegraph Company, with a capital stock of $1,000,000. The principal place of business is Phoenix, Arizona.

Robert Means has purchased the Saybrook (Ill.) telephone exchange for his son, Howard, who took possession November 1. The new firm will be called H. R. Means & Company. H. Van

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Gundy, the retiring manager, will remain in Saybrook for the present.

F. Neal of Kittanning is securing right of way for the Butler & Coylesville and Kitanning telephone lines, which will be built to Butler via Coylesville, Pennsylvania, and will be a feeder to a new line into Pittsburg.

Irving H. Griswold, representing the Home Telephone Company of Albany, Troy, Schenectady and Cohoes, New York, has purchased controlling interest in the Interstate Telephone Company of Little Falls.

Manager William Buchholtz of the Northwestern Telephone Exchange Company at Mankato, Minnesota, has been promoted to a position in the Twin Cities. He is succeeded by Fern W. Eaton of Benson, Minnesota.

H. Durant Cheever of the Okonite Company, New York City, returned recently from the Maine woods where, with Mrs. Cheever, he spent several weeks hunting big game. The largest moose secured by the party was shot by Mrs. Cheever.

J. Meinema, who has been spending several weeks in the west for his health, is much improved and has returned to Chicago to assist his brother, A. Meinema, in introducing the latter's new selective lock-out system at the Interstate convention.

Charles Lewis, Sydney Scott and E. B. Hill, as representatives of the Osceola (Ill.) Telephone Company, were in Bradford, Illinois, recently in conference with the Buda-Bradford Milo Company, negotiating for the consolidation of the two companies.

J. T. Spencer, general manager and secretary of the Whittier (Cal.) Home Telephone Company, recently visited Kansas City, St. Louis, Chicago and New York. While in Chicago Mr. Spencer purchased material for reconstructing the system at Whittier.

Thomas Convey, president, William Kramer, secretary, and James McLaughlin and P. H. Miess of the Ridgeway Telephone Company have petitioned the Dodgeville, Wisconsin, city council for a franchise to construct a line through the state and install a local system.

J. G. Sigler has accepted the position of manager of the Kinloch Telephone Company's exchange at St. Charles, Missouri. The former manager, George P. Player, who has been appointed wire chief of the company's long-distance service, will be located in St. Louis.

J. H. Romaine, George Jewett, F. C. Romaine and N. James are interested in the construction of a new telephone line from Dayton, Washington, to J. H. Romaine's ranch, about seven miles from Dayton. The company is known as the Happy Flat Telephone Company.

James F. Fairman, telephone engineer, who was recently associated with Waterbury & Company, New York City, is now associated with the Ericcson Telephone Company, New York city. Mr. Fairman will look after the business end of this company for the eastern territory.

O. M. Frykman of Minneapolis was in Chicago recently endeavoring to interest capital in a new four-party selective telephone. The instruments are now in use and Mr. Frykman will proceed to manufacture this telephone in the near future unless he disposes of the right to manufacture same.

P. Kerr Higgins has resigned his position as superintendent of equipment with the Home Telephone Company of Los Angeles, to accept charge of the long-distance lines of the United States Telephone and Telegraph Company on the Pacific Coast. A. B. Fry, formerly wire chief, has succeeded Mr. Higgins.

A. B. Nichols has been canvassing the business men of Perry, Oklahoma, for subscriptions to the Farmers' Telephone Company, which has a line under construction into the city. The business men are subscribing liberally to the enterprise, and the line will be pushed forward to completion as rapidly as possible.

Henry Schwab, secretary of the Monarch Electric and Wire Company, Chicago, was recently married to Miss Bertha Benedict at Kinsley's in the above city. Following the ceremony the bride and groom departed for a tour of California and the west. They are now at home to their friends at the Windermere Hotel, Chicago.

J. W. Bang and C. H. Barrows of Waverly, Iowa, have organized two rural telephone companies, one the La Fayette Rural Telephone Line, of which J. B. Baker is president and J. W. Wilkin secretary and treasurer, the other the Washington Rural Telephone Line, of which F. C. Meyer is president and S. M. Lehman secretary and treasurer.

E. H. Martin of Webster City, Iowa, has just completed arrangements with the citizens of Vincent, Iowa, to install a new telephone exchange at that place, including all rural lines in that vicinity. The company will be chartered under the name of the Vincent Telephone Company, but the Martin company will be the heaviest stockholder and practically control the plant.

Alderman Alexander W. McRae, H. E. Scoville and H. R. Robinson of St. John, New Brunswick, representing the Independent Telephone Company of that city, recently inspected the automatic plant of the Citizens' Telephone Company at Grand Rapids, with a view to securing data to present to the home municipality, as a movement is on foot in St. John to install a municipal telephone plant.

Y. Shinto, B. Sc., of Tokio, Japan, is now in the United States. He will make a somewhat extended tour throughout the country in order to secure data, which will permit of the preparation of an exhaustive report on electrical matters for submission to the Japanese government. Mr. Shinto is a brother-in-law of Prof. I. Fujioka of Tokio, who is well known in the United States.

N. D. Smith, who has been managing the exchanges at Paducah, Kentucky, and at Jackson, Tennessee, for the Independent Telephone Company, has gone to Jackson to remain, the duties there demanding his entire time. Heretofore he divided his time between Paducah and Jackson. The management at Paducah is assumed by H. E. Murty of Troy, New York, who has arrived and taken charge.

George L. Cragg, patent attorney, 1453 Monadnock block, Chicago, and Miss Miriam B. Thomas of 4039 Lake avenue, the same city, were married November 9 at the home of the bride, the Rev. Dr. Frank Du Moulin officiating. After a trip to Cuba and the eastern cities of the United States Mr. and Mrs. Cragg will return to Chicago to reside. Mr. Cragg is well known among the telephone fraternity.

Harry Shurtleff Durant of the sales department of the Automatic Electric Company and manager of that company's exhibit at the St. Louis Fair, was married recently to Miss Ida Ridgeway Hair, daughter of Mr. and Mrs. Benjamin Norton Hair, 1030 Forest avenue, Evanston, Illinois, at the bride's home. Mr. Durant is a Chicago boy, a graduate of Ann Arbor, and one of that University's former football stars.

Dr. Henry S. Herr, en route from Cleveland, Ohio, where he had recently been on telephone business, to Ottumwa, Iowa, stopped off in Chicago and paid the office of TELEPHONY a brief visit. He reports the Independent movement in the Hawkeye state making the greatest progress in its history, and states that while Independent development the past year eclipsed all previous records in Iowa, the coming year's growth will exceed even that of 1904.

G. C. Fricke, who, since February, 1901, has been purchasing agent for the Standard Telephone and Electric Company of Milwaukee, has accepted a position as traveling representative for Frank B. Cook. Mr. Fricke's experience in the telephone field dates back to 1896, when he was in the cable department of the Western Electric Company. He was transferred from the cable to the switchboard department, and later was taken into the office. In November, 1899, he accepted a position with the Kellogg Switchboard and Supply Company, having charge of the stock room for a short time, and then going into the purchasing department in the capacity of assistant purchasing agent. This position he held until he resigned to take charge of the purchasing for the Standard Telephone and Electric Company. Mr. Fricke, during the eight years in which he has been actively interested in the telephone business, has made many friends and is well qualified to represent Mr. Cook in his large and growing business.

FROM RURAL EXCHANGES.

Quite a few have telephones in.—*Duck Creek Doings in Emporia (Kan.) Gazette.*

There is talk of a new telephone line in our corner.—*Needmore News in Grover Hill (O.) Reporter.*

There is quite a number of 'phones being placed in our homes at the present.—*Bowling Green (O.) Sentinel.*

That telephone man has forgotten his agreement with our people. How long are we to wait for our hello?—*Central Chips in Louisiana (Mo.) Press.*

John Clawson is being kept quite busy putting in telephones. It is now "give me 'phones or death."—*Greensfork Items in Richmond (Ind.) Items.*

The people of this vicinity are complaining a good bit about their "wireless" telephone system.—*Hardrow Handouts in Columbian City (Ind.) Mail.*

The telephone gang has at last connected Napton with Marshall and our citizens are all trying to use their 'phones at once.—*Napton Nubbins in Marshall (Mo.) Index.*

Our 'phone men are about done with connecting Texas with the outside world, and we hail the new born improvement.—*Texas Notes in Wilmington (O.) Democrat.*

P. O. Nelson installed a telephone in his residence Friday of last week and is now prepared to communicate with more dispatch.—*Svea Splinters in Willmar (Minn.) Gazette.*

The new telephones are in operation and the wires are kept hot by people who are rather curious about electric currents.—*Prairie Home Pointers in Brookings (S. D) Press.*

Telephone Tales Tersely Told

A third telephone company is about to enter Iowa Falls, Iowa.

An automatic telephone system will probably be installed at Normal, Illinois.

The Hastings (Neb.) Independent Telephone Company has been incorporated for $300,000.

The establishment of an automatic telephone exchange in Tiverton, Rhode Island, is now being considered.

The Wabash Telephone Company has installed a new switchboard in Monroe City, Indiana, to accommodate its patrons.

The city council of Red Lodge, Montana, has denied the application of the Bell company to establish an exchange at that place.

The handsome new exchange building of the Citizens' Telephone Company at Columbus, Ohio, is being rushed to completion.

The Pennsylvania and Logan Valley Railway Company will shortly install an Independent telephone system along its own lines.

The Robinson telephone interests in southwestern Minnesota, managed by "Telephone Robinson" of Pipestone, are seeking a local franchise at Westbrook.

At North Birmingham, Alabama, the new telephone system of the People's Home Telephone Company has been completed and all the telephones installed.

The Lincoln County (Minn.) Telephone Company has completed its line from Hendricks to Ivanhoe and work is now commenced on the Ivanhoe exchange.

The Pioneer Telephone Company, which will expend about $60,000 in improvements, contemplates constructing a new exchange building at Muskogee, Indian Territory.

There is a much improved telephone service at Beatrice, Nebraska, since the Independent Company opened for business. This company now has 400 telephones in service.

An Independent telephone company is being organized at Leithsburg, Illinois, particularly to secure connections with outlying communities and other towns in Mercer county.

There is a proposition on foot to establish a police telephone system in Stillwater, Minnesota, in connection with a new fire alarm system that is to be established at an early date.

The Erie Railroad has about completed its plans for the installation of a telephone service between Cleveland and Jersey City. The cost is estimated to be between $100,000 and $125,000.

The Business Men's Club of Covington, Kenutcky, has petitioned the councils of various villages, asking that the Queen City Telephone Company of Cincinnati be granted a franchise.

High rates and unsatisfactory service of the Cumberland Telephone company have aroused the ire of citizens of Henderson, Tennessee, and an Independent company has been organized.

The Minnesota Valley Telephone Company has made connections with Worthington and Windom, giving connections with Sioux Falls, Heron Lake, Brewster and other points via the Minnesota Valley.

The Central Nebraska Toll Line Company has been incorporated, with a capital stock of $100,000. The company will construct a toll line to Lincoln and connect with the Lincoln Telephone Company.

One of the advanced students of bacteriology at the University of Wisconsin is making a study of the number and character of bacteria present in telephone transmitters under ordinary conditions.

Work on the new automatic telephone exchange at Sioux City, Iowa, is reported to be about one-half completed. It is expected that the system will be complete and ready for operation early in the spring.

The Farmers' & Merchants' Mutual Telephone Company of Le Sueur, Minnesota, has just completed and opened a line from Le Sueur to Belle Plaine. The company now has 250 members and is in a prosperous condition.

The Co-operative Telephone Company of Detroit has established direct copper connections with Toledo, having over 9,000 Independent telephones and other exchanges in Ohio and Indiana, with over 400,000 subscribers and low rates.

The Co-operative Telephone Company of Flora, Indiana, has been purchased by the Miller telephone system of Carroll county, the consideration being $8,000. This gives the Miller company control of practically the entire county.

The Inter-State Telephone and Telegraph Company, located at Aurora, is actively engaged in an effort to secure and to disseminate a daily weather report service, over northern Illinois Independent lines, most of which have promised co-operation.

The Columbus (Ohio) Citizens' Telephone Company is erecting a new building at Dublin, Ohio, for the accommodation of the exchange at that place. The second floor will be used as the exchange with storerooms on the lower floor. It will be completed in several months.

The Cincinnati Bell Telephone Company has offered a reward of $1,000 for the arrest and conviction of the murderer of Miss Alma Steinigeweg, who was one of the company's operators at Park exchange, near where she was found murdered Wednesday morning, November 2.

Twenty-seven business men in the towns of Millcreeks Valley, Ohio, have ordered the City and Suburban (Bell) Telephone Company of Cincinnati to remove its telephones from their places of business on the ground that the agreement is broken by the recent increase of rates.

The Southwestern Telephone Company of Anthony, Kansas, has built to Duquoin, a distance of twelve miles from Harper, to connect with the toll line of the Kingman Telephone Company. This gives the Southwestern direct Independent connections into Wichita and Hutchinson.

Work has been commenced on a telephone system for the Cheyenne River Indian reservation lines to be run from the main agency near Forest City, South Dakota, to Cherry Creek, in the southwest corner of the reservation, and to White Horse Camp in the northwestern corner.

Preliminary steps have been taken at Keyser, Maryland, for the establishment of an Independent long-distance telephone company. A line will be built between Philadelphia, Baltimore and Pittsburg, extending through Romney, West Virginia, Cumberland, Piedmont, Keyser, Oakland and Somerset.

A number of prominent Oneida, New York, business men are interested in having a local office of the Home Telephone Company installed in that city. The company already has a franchise to operate a toll line there, but the question of a local franchise has not been agitated until recently.

Miss Clytie Griggs, a pretty "hello girl" of Kansas City, was notified by attorneys in Cape Nome, Alaska, that she had fallen heir to mines and mining stocks valued at $500,000, the estate of her cousin, Mrs. Lillian Warner Moore, who died there recently. She has gone north to claim the property.

If an absent-minded man forgets to hang up the receiver when through using the telephone, the "howler" gets after him at Cleveland. The Cuyahoga Telephone Company has just adopted it. It does just what its name implies—it howls, and keeps on howling until the subscriber hangs up the receiver.

An ordinance has been introduced into the city council of Crete, Nebraska, granting a franchise to the Western Telephone Company at Lincoln to enter the city for the purpose of establishing a toll station. The company will probably endeavor to secure a franchise later to establish a general system in the city.

One of the Reformed churches at Dayton, Ohio, has completed arrangements for the installation of several megaphones in the church, to be connected with telephones ending into the hospitals and the homes of invalids. By this means the sick will be able to hear the music and preaching without leaving their beds.

The Citizens' Telephone Company of Cadillac, Michigan, has decided to extend its lines to Meauwataka, Boon and Henrietta. Construction work will be started shortly and it is expected that the system will be in operation in three villages before the first of next year. A large number of farmers' lines will be installed.

The American Construction and Trading Company of Elyria, Ohio, has purchased a half interest in the Interstate Telephone Company of Little Falls, New York, for the purpose of making a link in a cross-state long-distance Independent telephone service. Irving H. Griswold of Albany represents the new purchasers.

The committee on gas, oil and electricity of the Chicago city council has reported, recommending that a special committee be appointed to deal with the various phases of the telephone situation in Chicago and to hear all disputes concerning the telephone companies, their rates, toll charges, franchise extension claims, etc.

The Calhoun County (Mich.) Telephone Company has opened up a new territory in southern Michigan and northern Indiana in addition to the regular toll points. The new points reached in Michigan are: Fairfax, Nottawa, White Pigeon, Constantine, Coldwater, Quincy, Batavia, Bethel, Matteson, Girard; and in Indiana:

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Orland, Angola, La Grange, Rome City, Kendallville, Goshen, Elkhart, South Bend, Mishawaka, Fort Wayne, Albion, Lafayette, Butler.

One of the best telephone lines between the Twin Cities and Duluth is that maintained by the Northern Pacific. Voices in Duluth sound as if in the same room with the speaker at Minneapolis and vice versa. The service is very clear because there is no interruption on the line. The same wire is used for telegraph also.

The stringing of the second copper wire between Muskegon and Hart (Mich.) is completed. Work was begun last spring by the Citizens' Telephone Company of Muskegon and carried as far as White Hall by that company. The remainder of the distance has been finished by the Lake Shore Telephone Company of Oceana county.

A deal has been consummated whereby the Farmers' Telephone Company of Lee county, Illinois, has purchased the Lee County Telephone Company's exchanges and property in Franklin Grove, Ashton, Amboy, Lee Center, Sublette and Walton. The Farmers' Telephone Company was organized about a year ago by H. W. Hillison.

The new telephone system, which will connect Gainesville, New York, with the villages of Castile and Silver Springs, is nearing completion. The exchange will start work with about 125 subscribers and represents a total investment of about $15,000. The principal organizers of the company are H. A. Pierce, M. N. Cole, A. B. Windsor.

It is stated that the Northern Pacific is about to complete the installation of a telephone system on its lines between Pasco, Washington and Jamestown, North Dakota, from Pasco to the Pacific Coast and from St. Paul to Jamestown, thus establishing a speaking service over all portions of the route from St. Paul to the Pacific Coast.

The Oil Belt Telephone Company, recently incorporated at Norwalk, Ohio, with a capital stock of $25,000, will build exchanges at Cygnet, Portage and Jerry City in Wood county, with connections and free service with the Independent exchange at Bowling Green. It is estimated that over 150 miles of wire will be strung and 500 telephones installed.

The Home Telephone Company of Los Angeles, California, reports the installation of 20,000 telephones. There are nearly 200 private branch exchanges, some having 300 telephones. At the present time long-distance lines are being projected which will eventually cover the whole of that state with a network of lines that will tap every village.

The telephone system and exchange at Maroa, Illinois, has been formally transferred from the People's Telephone Company to the Moroa Mutual Telephone Company. The stipulated price of $13,500 was paid over in cash, $1,000 having been paid when the contract was made some six weeks ago. Elliott James has been appointed manager of the company

The front of the Sioux City (Iowa) Telephone Company's building will be one of the most imposing in that city. It has been determined to put in a front of white terra cotta and red brick. The building is rapidly nearing completion and workmen are now engaged upon the second floor. The building will be fireproof even to the windows and doors.

The El Paso Telephone Company has been organized at Colorado Springs, Colorado, with a capital stock of $500,000. The officers are: H. B. Hames, president; William Gesford, vice-president; C. D. Taylor, secretary, and Robert McReynolds, treasurer. The company expects to begin work at once and will extend the system throughout the state.

Manager L. K. Smith and others of the board of directors of the Georgia division of the Gainesboro Long-Distance Telephone Company, which established headquarters at Carrollton, Georgia, about four years ago, have just closed a deal with the owners of the Carrollton local telephone exchange whereby the long-distance company gets the city exchange.

In about two weeks' time the telephone system of the city of Macon, Georgia, will be in the new building now nearing completion on the corner of Poplar and Second streets. The apparatus for a largely increased business has been placed in the new building and a number of telephone experts have been on duty placing this apparatus for several weeks.

A plan is now on foot at Fort Worth, Texas, to consolidate the Independent telephone exchanges of Brownwood, Ballinger, San Angelo, Paint Rock, Eden, Menardville, Coleman and possibly Abilene, Sweet Water and Colorado. The matter has not yet crystallized into definite shape. Fort Worth capital will be largely interested in the new company.

John A. Driscoll, president of the Wayne-Monroe (N. Y.) Telephone Company, and George Tinklepaugh of Palmyra have been in consultation with Sheriff Yeomans and others at Lyons, New York, with a view to consolidating the Wayne Telephone Company, of which the Lyons Telephone Company is a branch, with the Wayne-Monroe Telephone Company, which would give Lyons service to Oswego and other intermediate points as far east as Buffalo.

Nowhere in the country have the Independents won a greater victory than in Toledo. The Toledo Home Telephone Company now has 9,000 telephones in operation against 2,500 in operation by its Bell competitor in the same territory. The service given by the Toledo Telephone Company is first-class and the company is making satisfactory earnings on its stock.

F. C. Toepleman, general manager of the Home Telephone and Telegraph Company, has just opened up at New Bern what is the most up-to-date exchange in North Carolina. It is built for an ultimate capacity of 800 with a present equipment of 400 subscribers. This company purchased the exchange of 100 subscribers in 1898 and is now giving service to 310 subscribers.

The National Telephone and Telegraph Company of West Virginia has filed a certificate of incorporation under the laws of Indiana. The capital to be invested in Indiana is $175,000 and the principal office will be in Ft. Wayne. William L. Moellering is the state agent, while Frank H. Cutshall, William Paul, George T. Cox and others, all of Ft. Wayne, are Indiana stockholders.

A movement is on foot to put in a new telephone system at West Palm Beach, Florida, with a probability of making it a long-distance system. For several years the East Coast Telephone Company has had a franchise, but for some reason the system has not been well patronized, and it is now claimed by many that it needs telephones, but that the present system does not meet the demands of the city.

The Inter-State Telephone Company, whose general offices are in Aurora, Illinois, has been taken off the unfair list by the Trades Assembly at Elgin. It was put on the list about a year ago over grievances with the telephone girls. The trades council took it off the list as a centure to the Chicago (Bell) Telephone Company, which refused to live up to the dollar ordinance passed by the council.

A network of rural telephone lines will have its center at Parker, South Dakota, as the result of the organization and incorporation of the Steininger Telephone Company, with a capital of $50,000. The company is composed of capitalists residing at Parker and at towns in that vicinity. J. A. Steininger is president and general manager of the company, and will push the work of constructing rural lines as rapidly as possible.

Denton, Texas, in addition to being supplied with good telegraph facilities, has two fine telephone exchanges. The first telephone system installed in that city was meagerly patronized. Now, however, there is a vast difference in the condition of things. The People's Home Telephone Company only recently completed the installation of its plant there at a large outlay of money and labor. The plant is one of the most up-to-date in Texas.

The Independent Union Telephone Company, which has had its principal office in Buffalo, New York, has filed with the secretary of state a certificate changing its office to Albany. The company is represented by Attorney Howard Hendrickson of Albany, and among its directors are: Irving H. Griswold, Samuel B. Rawson, Frederick H. Sudro and Theodore M. Brush of Elyria, Ohio, all of whom are directors of the Albany Home Telephone Company.

A number of Independent telephone organizations, including those in Orwell, Warren Center, Neath and Jackson Valley, Pennsylvania, have consolidated, and a company has been formed to be known as the People's Co-operative Telephone Company, the officers of which are as follows: President, D. Cowles; secretary, B. H. Phelps; treasurer, Hugh Jones. It is understood to extend to the connections south of Stevensville joining with the Rush system.

The Vanderbilts have completed their Independent long-distance telephone line between New York and Chicago. The Lake Shore & Michigan Southern Railway Company constructed one part of the line between Chicago and Buffalo, and the New York Central officials constructed the other part along the route of the West Shore road, between Buffalo and Weehawken. All that now remains is to carry the system from Weehawken to the Grand Central station in New York.

The trouble between the Bell company and the Union Telephone Company at Owosso, Michigan, extends even to the young lady operators in the two offices. The girls. it is said, refuse to speak on the streets and caution their young men to have nothing to do with the girls of the other office, either at dances or anywhere else. Since the dry goods stores disconnected their Bell telephones that company has been paying the expenses of its operators to Detroit to do their shopping.

Information has been received by President Hoge of the National Indiana Telephone Association that work is progressing rapidly on the proposition to connect Pittsburg with Philadelphia and Baltimore by long-distance telephone. Philadelphia is now connected, but the wires are too small for talking with Cleveland. Heavy wires will be strung, however, for the long-distance business and in a short time Cleveland and Ohio people will be able to

talk with Pittsburg and Baltimore over the long-distance wires of the United States Telephone Company. This will make the Independent long-distance wires stretch from Kansas City to the Atlantic Ocean.

The new telephone cable across Agate Passage, off the Pacific Coast, near Bartow, Washington, has been successfully laid, a rather difficult task, owing to the prevalence of swift tides in the channel. The highest tide in several months flowed through a low breakwater and flooded the space in front of the local agent's house, but did not reach high enough to overflow the telephone company's cable landing. A temporary telephone connection with Seattle has been established on the line to Port Townsend.

The Duluth (Minn.) Telephone Company has made a number of extensions to its line, including one to Pike lake, Adolph, Five Corners and Midway. The company intends running a telephone line around Pike lake next season for the benefit of the campers. The line between Duluth and the ranges has been practically rebuilt. The company has in view an extension to Grand Rapids next season, and a line will be built from Nashwauk to Grand Rapids as soon as there is a suitable road built along which to string poles and wires.

The New United States Telephone Company, which plans a trunk line from Chicago to New York, has arranged to buy several plants in the Philadelphia district along the proposed line, among them those at Norristown, Reading, Allentown, Scranton, Wilkesbarre, Mauch Chunk, Harrisburg, Altoona and McKeesport, which by traffic arrangement have connection with the Keystone system in Philadelphia and the Knickerbocker in New York, which will also be absorbed by said company. It is planned to have the new trunk line in operation within a year.

John Sebastian of the passenger and promotion department of the Rock Island road is co-operating with Des Moines, Iowa, people in an effort to secure the removal to Des Moines of a factory manufacturing telephone parts, and which has a considerable trade established. Manager Bellamy of the Mutual Telephone Company is also interested in the matter. The name of the company has not been given out. The firm is said to be financially responsible, to be enjoying a good trade, employing a number of operatives and with excellent prospects for the future.

Tullahoma, Tennessee, is to have a new telephone company. It will be a home concern, Independent, composed entirely of home capital. This comes about, it is stated, because of what is termed the unreasonable exactions on the part of the Cumberland Telephone Company. There is, and has been for a long time, much complaint of the high rate of charges made by the Cumberland company, until the people have tired of the matter, and have concluded to have "one of their own." The stock has all been subscribed and parties interested in the enterprise will go right ahead.

Pascal Parker, vice-president and treasurer of the Liberty (Mo.) Telephone Company, writes as follows: "The Missouri Independent Telephone Company has recently been incorporated, with the principal office at Liberty, Mo.; capital $10,000. This company will build and operate toll lines exclusively. Work is now being pushed on a line between Cameron and Liberty, which will reach intermediate points, and connect at the latter place with the Home Telephone Company of Kansas City. This line will be built first-class in every respect, equipped with No. 10 copper metallic wire."

Ohio capital has secured control of the Home Telephone Company of Charleston, West Virginia. This action is said to mean a complete reorganization of the company and a material extension of the system, which will comprise extensions to the north and west and will ultimately connect with the Columbus and Dayton systems; and also to the south. It is understood the deal represents an investment approximating $200,000 and is the entering wedge of a movement to control the telephone business of central West Virginia. Frank L. Beam and Cyrus Huling have been elected directors of the company.

A telephone war is now in progress at Ocean Beach, California. At a recent meeting of the board bids were opened from Blankenhorn and Porterfield at $100 each. Competitive bidding was then in order, and the franchise was awarded W. L. Porterfield for the sum of $550. Blankenhorn's last bid was $500, when he withdrew after reminding the board that his permit still had five months to run and that his company had already spent about $6,000 in laying conduits and in gathering material necessary for the establishment of a first-class telephone system, and asked the board to readvertise for bids.

P. G. Walton of Anthony, Kansas, president of the Southwestern Telephone Company, writes as follows: "We have just completed an exchange of about 1,500 capacity at Enid, costing something over $60,000, and are now rebuilding the Anthony exchange. We own the following exchanges: Anthony, Kansas, 300 subscribers; Harper, Kansas, 150 subscribers; Attica, Kansas, 50 subscribers; Carmen, Oklahoma, 125 subscribers; Cherokee, 100; Alva, 250; Enid, 150. We own and operate about 350 miles of toll lines and connect with all the Independent companies in southwestern Kansas and northwestern Oklahoma. We have a gross annual income of something over $50,000. We have been in business something over eight years and our company has always been on a dividend-paying basis." President, P. G. Walton; vice-president, F. R. Zacharias; secretary and treasurer, Fred Washbon.

The telephone war that is being waged at Superior, Wisconsin, promises to become more bitter, as it is claimed that the Independent Company is getting in better shape to make a fight for the telephone business of the city. This company is continually getting new long-distance connections and it announces that connections of great importance will be made within the next thirty days. The Independent companies of the state are building a line from Racine to the Mississippi river, which will give Superior connection with Racine, Kenosha, Madison, Janesville, Prairie du Chien, and other important points in the state.

The telephone interests of the L. C. Hayes estate at Watertown, Ohio, have been bought by S. W. Harvey, and incorporate papers have been applied for that will cover all the Hayes-Harvey lines, the Hayes, Harvey & Fisher lines, including one-half of the Beverly-Waterford exchange, the McConnellsville, Stockport, Lowell and Marietta lines, the Fisher & Wolcott line and the East Watertown line, all under one company, with an authorized capital stock of $10,000. The company has been incorporated under the name of the Barlow & Watertown Telephone Company, with headquarters at Watertown. All trunk lines will be reconstructed as fast as the weather will permit.

Representatives of the Kansas City Home Telephone Company and the Western Independent Telephone Company recently held a meeting at Kansas City to finish the negotiations whereby the long-distance lines of the company are to be taken over by the Home Company. Those in attendance at the meeting were E. L. Barber, Wauseon, Ohio; James S. Brailey, Jr., Toledo, Ohio; Lee Benoist, St. Louis; Arnold Kalman, St. Paul; J. J. Heim, O. C. Snider and Hugh C. Ward, Kansas City. The company is considering the matter of extending its lines from Ottawa, Kansa, throughout the gas and oil fields of Kansas and Indian Territory. Reports showed that the company had gained 600 subscribers a month since May, and the long-distance lines in a like ratio.

The Ann Arbor (Mich.) Argus says: "Returns from the Michigan-Wisconsin football game Saturday were received at several places in the city, but nowhere were they so complete as those furnished by the Washtenaw Home Telephone Company. The company had a football expert on the long-distance at Madison, and he gave each play the moment it took place. It was a considerably faster operation than any other means of getting returns, and allowed of more detail and explanation. The Argus used the Washtenaw Home Telephone Company's returns and they were also given out on State street, a man with a megaphone announcing them to a large crowd which had collected in the street in front of the establishment." The Bell company attempted to give similar service, but lost out in the middle of the first half. The enterprise of the Washtenaw company was highly praised in Ann Arbor.

R. W. Kemp, consulting telephone engineer of Wellington, Kansas, has been promoting the combination of several rural lines that center in Wellington. As soon as the Chickaskia Mutual Telephone Company of Milan finished its line, which will be about sixty miles in length, the companies will unite and those that have not a toll wire between stations will string one. These lines will be used exclusively for the rural toll business, each member having free service over all lines. Toll stations will be established in all villages and in the thickly settled parts and a small charge made for non-subscribers. When these companies—the South Haven Mutual Telephone Company, the Nimniscah Valley Telephone Company, the Braman Mutual Telephone Company, the Oklahoma & Kansas Corporation and the Oxford Telephone Company—combine they will represent over 4,000 telephones and will give about 500 miles of toll lines mutual service.

A PROTEST FROM GEORGIA.

Yes, they raise the price of the telephones
From two dollars up to three;
But no use to get sore, for they might want more,
Such is the graft of monopoly.

No, friends, if we would agitate the wire,
We must surely cough up the three;
There's nothing to it, we've got to do it;
Such is the graft of monopoly.

Go on, dear friends, and pay the price,
Or you will surely see
That if you get sore, they'll want still more—
Such is the graft of monopoly.

We cannot afford to "cut them out,"
So pay the price we must;
But we realize that a new franchise
Is needed to "bust the trust."

—*Dalton (Ga.) Argus.*

XUM

IN THE RURAL LINE DISTRICTS

Willie Hutchinson has taken the position of night telephone operator and is learning the wires.—*Hartford (Wis.) Press.*

Our telephone system is about completed and is a great thing for the village.—*Mayer Musings in Watertown (Minn.) News.*

The telephone men are busy putting in "phones" and it is hoped that they will reach Jubilee by and by.—*Jubilee Jots in Peoria (Ill.) Star.*

Maude & Anderson of Burbank are building their telephone lines all over this country. It's a very fine thing to have.—*Elk Point (S. D.) Courier.*

The telephone company is running a branch line up Goose Hollow, where they have quite a number of patrons.—*Brookville Bubbles in Polo (Ill.) Press.*

The rural telephone is now in running order around town and every one is hollering hello to each other.—*Humboldt Hurrahs in Hartford (S. D.) Herald.*

A social telephone line is talked of being built here at the Path from Munnsville. There are several subscribers who want 'phones. —*Bear Path Breezes in Oneida (N. Y.) Post.*

Miss Gertrude George, the accommodating operator of the Bone Gap telephone exchange, passed through Albion Thursday evening en route from Fairfield.—*Albion (Ill.) Journal.*

Miller is a full fledged telephone town with an up to date central exchange. Dr. Norcross' numbers are, residence, 0; office, No. 1.—*Miller Murmurs in Kearney (Neb.) Daily Hub.*

Miss Olga Oman went to Minneapolis about two weeks ago to accept a position in the Twin City telephone exchange there. She seems to enjoy her work.—*Cambridge (Minn.) Press.*

The Jay Bird 'phone company met at Steve Darbey's Monday night and discussed the advantages of a farmers' switchboard.— *Elevatum Schola Echoes in Lancaster (Mo.) Republican.*

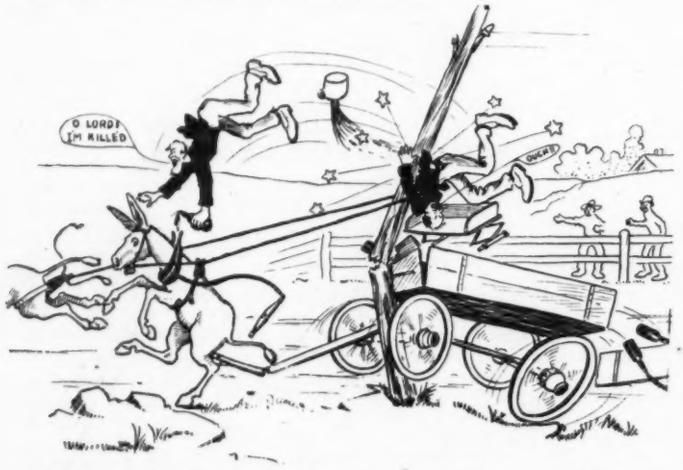
Neighbor Geo. Sheridan has become a member of the Wards Grove Telephone Company and will soon be able to talk to his friends.—*Wards Grove Gleanings in Galena (Ill.) Gazette.*

There is a new "hello" boy in town. It's a son at Telephone Manager Chas. E. Knickerbocker's home, and came over the wire on Friday.—*Concord Crumbs in Albion (Mich.) Recorder.*

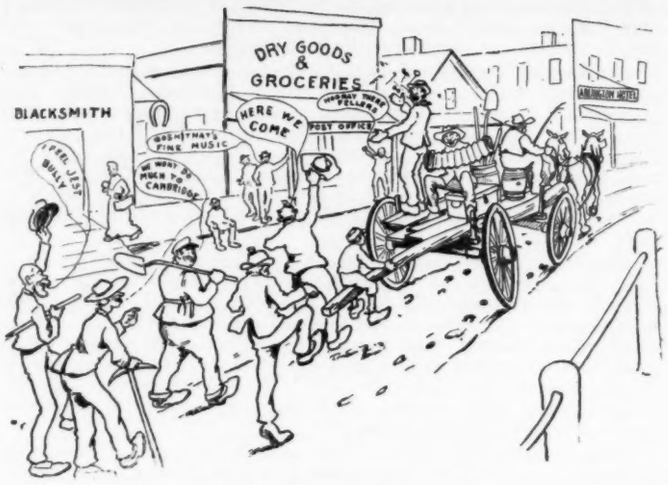
The telephone line at McHattie's corners is an established fact and now the patrons are wondering how they ever got along without it.—*Woodbury Whispers in Stillwater (Minn.) Gazette.*

Henry Eggers of Plainview was in our village this evening. He has been looking over the telephone line, which is sadly on the "bum."—*Beaver Brevities in Winona (Minn.) Republican-Herald.*

The Ladies of the Rural Telephone Northwest gave a dancing party at Woodman hall at Withrow last evening. "It takes the ladies to do things up brown," remarked some one who attended the function. We think that must be so according to reports of those present.—*Stillwater (Minn.) Gazette.*



Two Lac qui Parle county farmers were hurt by running into a telephone pole while on their way home one day recently. But had they been sober they would not have met with the accident. Go home sober and you will be all right.—*Granite Falls (Minn.) Journal.*



The Twin City telephone gang folded up their tents and moved into town on Monday, depositing their luggage at the Arlington. Their triumphant entry was accompanied by sweet strains from an accordion.—*Cambridge (Minn.) Press.*

Israel Borroughs can say hello to his neighbors now, as he had a new Mutual telephone placed in his home last Wednesday afternoon.—*Gilltown Glimmers in Bowling Green (Ohio) Sentinel.*

The telephone meeting was well attended, but not much progress was made. It began to look like the women were going to have to try their hands.—*North Pike Pickings in Emporia (Kan.) Gazette.*

The Parker and Roosevelt telephone line between this village and Drake's is about ready for business. For any information pertaining to this line see Dock 16 to 1, the superintendent.—*Melrose Mites in Chetopa (Kan.) Clipper.*

Hurrah for the telephone! Be up to date and put in a telephone. W. McLaughlin was out here Wednesday getting subscribers for a telephone line from De Pere south to Con O'Keefe's.—*Rockland Ripples in De Pere (Wis.) Democrat.*

The "telephone ear" is the latest disease. It came with the advent of the rural 'phone system and is caused by having the receiver glued to the ear twenty-three hours out of a possible twenty-four.—*Hume (Mo.) Telephone.*

A telephone is the newest thing in these parts; we think most of the people took one, so that it will do away with the neighbors visiting each other; they can stay at home and talk.—*"Happy Hooligan" in South Highland Items, Hastings (Neb.) Tribune.*

The Salina telephone crew, consisting of Mr. Anderson and Misses Baird, Harvey and Rumrill, drove over from Salina Sunday afternoon to spend the evening with our worthy telephone people, Mac and the Misses Shephard.—*Bennington (Kan.) Democrat.*

We have a telephone line through our neighborhood from Zephyr to Comanche now, which renders splendid service (when it is in good shape) and will continue to do so just as long as it can stand up.—*Mercer's Gap Mentions in Brownwood (Texas) Bulletin.*

Those who were inclined to doubt that Fairland would get its telephone system in operation this year will probably soon have to give it up, as all indications show that in course of a few weeks at least we will be flirting with the hello girl. The line to Grove is to be put in right away also and will possibly cross the river at Carey's.—*Fairland (I. T.) Newsboy.*

P. B. Smith, lineman for the Odell Telephone Company placed a 'phone in the postoffice here Wednesday, and those having items to send can call 371 and report. Should any of the writer's friends wish to talk to the blacksmiths or any one else, we will endeavor to get them to the 'phone and will not put up any kick about it, either. —*West Point Pointers in LaFayette (Ind.) Journal.*

Dan James of Toledo paid his respects to his old home near Long's Crossing, and during the day constructed a novel telephone line from his mother's house to Robert Avery's, using the barbed wire fences along the entire line. It works to a nicety, and free concerts are held almost every night either at one end of the line or the other—whichever house has the best crowd—the musicians, of course, being at the opposite end of the line.—*Genoa (Ohio) Times.*

ALABAMA.

FAIRHOPE—The Baldwin County Telephone Company. Capital stock $6,000. Incorporators. Aaron Moog, and others.

ARKANSAS.

HOT SPRINGS—The Hot Springs and Point Cedar Telephone Company. Capital stock, $2,000. President, L. B. Estes; vice-president, C. H. Easley; secretary, H. Hardy; treasurer, Wm. Lambert.

CALIFORNIA.

SAN FRANCISCO.—The Central Energy Secret Telephone Company. Capital stock, $1,000,000. Incorporators, L. M. Brokaw of Seattle, R. J. Davis, I. P. Allen, Alexander Mackie and E. B. Rogers.

IOWA.

JEFFERSON—The Star Telephone Company. President, B. Curtis; treasurer, J. D. Neil.

DES MOINES—The Clinton Valley Farmers' Telephone Company. Capital stock, $1,000. Incorporators, C. W. Faust and others.

SUTHERLAND—The Gaza-Sutherland Telephone Company. Capital stock $600. Directors, J. J. Short, H. E. Kaiser, B. F. Miller, Frank Tierney, Frank Dabric.

PETERSON—The Spring Brook Rural Telephone Company. Capital stock, $1,000. President, Henry Miller; vice-president, Theodore Roths; secretary, Fred Roggow; treasurer, Henry Stier; directors, C. H. Felton. George L. Keene, Albert Clark, Charles Mohrer, William C. Mueller, Fred Roggow and Henry Miller.

KANSAS.

PEKIN—The Pekin Telephone Company. Capital stock, $4,500.

ROSEHILL—The Derby and Rosehill Telephone Company. Capital stock, $630.

WHITEWATER—The Whitewater Telephone Company. Capital stock $15,000.

ELLSWORTH—The Lyons Telephone Company. Capital stock, $12,000. President, C. H. Pohlman, Ellsworth; vice-president, W. D. Jellison, Wilson; secretary, M. L. Meek, Ellsworth; treasurer, G. T. Tremble, Ellsworth; manager, H. N. Williams, Lyons.

MAINE.

PORTLAND—The Wilson Long Distance Telephone Company. Capital, $250,000. President, Millar W. Baldwin, Portland; treasurer, Geo. C. Knight, Portland.

ELLSWORTH—The Union River Telephone Company. President and general manager, Albert E. Mace, Aurora; secretary, Dr. J. H. Patten, Amherst; treasurer, T. Silsby, Amherst.

AMHERST—The Union River Telephone Company has been organized with the following officers: President and general manager, Albert E. Mace, Aurora; secretary, Dr. J. H. Patten, Amherst; treasurer, Herbert T. Silsby, Amherst.

SHERMAN—The Katahdin Farmers' Telephone Company. Capital stock $10,000. President, C. E. Milliken, Island Falls, Me.; treasurer, S. W. Porter, Crystal, Me.; directors, C. A. Wren, G. M. Morrison and T. D. Bradford, Sherman, Me.

MASSACHUSETTS.

BOSTON—The S. H. Church Company. Capital stock $25,000. President and treasurer, S. H. Couch.

MICHIGAN.

DETROIT.—The Shore Line Telephone Company. Capital stock $50,000. Directors, Charles W. Taylor, Charles E. Cheney and James A. Forrester.

MINNESOTA.

WRIGHTSTOWN—H. & W. Telephone Company. Capital stock $4,995, and may be increased to $50,000.

MISSOURI.

LAMONTE—The Lamonte Telephone Company. Capital stock $5,000. Incorporators, W. E. Files, W. F. Yankee, H. C. Mitchell, Arthur Bender, Joseph F. Staples, James A. Staples and others.

NEBRASKA.

PLATTE CENTER—The Farmers' Independent Telephone Company. Capital stock, $10,000; paid up, $2,000.

OSHKOSH—The Antelope Valley Telephone Company. Capital stock, $800. Incorporators, William J. McIntosh, John Pile, William W. Fought, and Moses Weatherby.

NEW HAMPSHIRE.

NEW HAMPTON—The Winona Telephone Company. Capital stock $2,500.

NEW JERSEY.

CAMDEN.—The Folding Cabinet Company. Capital stock, $10,000. Incorporators, Charles A. Wolverton of Bridgeport; T. E. French of Camden.

NEW YORK.

WINDSOR.—The Lester Telephone Company; capital stock, $2,000. Incorporators: Wilbur Brink, Levi Cresson, J. E. Kent, Windsor, N. Y.

AKRON—The Citizens' Telephone Company. Capital stock, $10,000. Incorporators, James S. Stearns, Richard H. Bell, I. D. Eckerson, Akron, N. Y.

UTICA—The Independent Telephone Securities Company. Capital stock, $800,000. Incorporators, Thomas W. Finucane, F. W. Zoller, George R. Fuller.

NEW YORK—The Spies General Electric Manufacturing Company. Capital stock, $25,000. Directors, P. H. Spies, S. Heyden, David S. Aarons, all of New York

MACDOUGALL—The MacDougall Telephone Company. Capital stock $5,000. Directors. Addison Baldridge, Alexander Baldridge of MacDougall and R. C. Allen of Romulus.

TONAWANDA—L. H. Ericsson Telephone Manufacturing Company. Capital stock, $200,000. Directors, Axel Bostrow of Stockholm, Sweden; F. M. Parker and C. H. Smith of Buffalo.

SYRACUSE—Reed Electrical Cordage Company. Capital stock, $50,000. President, Thomas S. Reed of New Haven. R. E. Benjamin of 1127 East Genesee street is also largely interested in the

JOHNSONVILLE—The Johnsonville Telephone Company. Capital stock $500. Directors, Jay D. Van Wirt, C. Ira Haner, Ernest H. Abbott, Clarence M. Herrington, Clarence E. Akin of Johnsonville, Hiram Sherman and E. D. Herrington of West Hoosick.

OHIO.

CLINTON.—The Twin City Telephone Company. Capital stock, $600,000; in Illinois, $30,000.

ROCKWELL.—The Rockwell Telephone Company. Capital stock, $25,000. Incorporators, E. N. Egge and others.

CALDWELL — Caldwell-Marietta Telephone Company. Capital stock, $25,000. Incorporators, A. L. Gracey, W. H. H. Jett, C. B. Barry, John Kaiser, R. O. Wooster.

WATERTOWN—The Barlow and Watertown Telephone Company. Capital stock, $10,000. Incorporators, S. W. Hawey, Roscoe Wolcott, H. Fisher, Lucy A. Fisher and Joseph Fisher.

CHESTERHILL.—The Chesterhill-Brown's Mill Telephone Company. Capital stock, $3,000. Incorporators, Fred McInturf, Ed Hopkins, H. S. Hopkins, John M. Russell and T. J. Edgerton.

OKLAHOMA.

NEW LYME—The New Lyme Telephone Company. Capital stock, $600. N. A. Smith and others are interested.

UNION.—The Union City Telephone Company. Capital stock, $5,000. Incorporators, F. L. Wilkins, T. M. Kirby and L. S. Fuhring.

PENNSYLVANIA.

NEW ALBANY—The New Albany Telephone Company. Capital stock, $5,000. Directors, R. S. Wilcox, R. Decker and S. D. Sterigere of New Albany and others.

LUMBER CITY—The Lumber City Rural Telephone Company has been organized. President, C. S. Kirk; secretary, Dorsey Hill; treasurer, Dr. H. Woodside; executive committee, D. H. Watts, J. M. Krebs, Harriston Straw.

SOUTH DAKOTA.

MADISON—The Orland Telephone Company has been organized at this place with the following officers: President, P. M. Venner; vice-president, Ole Erickson; secretary, Michael Cosgrove.

SOUTH CAROLINA.

GEORGETOWN—The Georgetown & Campfield Telephone Company. Incorporators, M. W. Pratt and O. B. Skinner.

TEXAS.

BROWNWOOD.—The West Texas Telephone Company; capital stock, $100,000. Incorporators: S. H. Woodward, J. A. Walker, H. T. Williams, N. H. Hellingsworth and G. N. Harrison, all of Brownwood; L. R. Conroe of Goldthwaite and R. S. Hollingsworth of Coleman.

VIRGINIA.

BEDFORD—The Southside Rural Telephone Company has been organized. Capital stock, $10,000. President, A. J. Gillespie; vice-president, Dr. S. H. Price; general manager, H. Pollard.

COFFEE—The Bedford and Campbell County Telephone Company has been organized by E. H. Brockenbrough, E. B. Milner of Coffee; A. W. Scott, J. F. Hudson and A. Meechenford, Forest Depot.

WASHINGTON.

SHELDON—The Carroll Township Telephone Company. Capital stock $5,000.

THORNTON—The Interstate Telephone & Telegraph Company. Capital stock, $5,000. President, J. J. Stephens; treasurer, Nelson Howard, both of Thornton; secretary and general manager, Dr. T. A. Swain, Pine City

WAITSBURG.—The Waitsburg Rural Telephone Company. President, J. W. Morgan; vice-president, Gus Vollmer; secretary, W. B. Brooke; treasurer, A. W. Phillips; E. M. Denton, Walter Price and Frank Jonas, trustees.

WISCONSIN.

SWISS—The St. Croix Valley Telephone Company.

LONE ROCK—The Lone Rock Telephone Company. Capital stock, $1,500. Incorporators, Andrew Harter, George Jamieson and H. Brace.

ANNUAL MEETINGS.

CONNECTICUT.

WOODBURY—At a recent meeting the Waterbury Automatic Telephone Company elected the following officers: President, Horace D. Curtiss; vice-president, Arthur D. Warner; treasurer and secretary, George F. Harvey; superintendent and general manager, Reynus F. Harvey.

ILLINOIS.

JACKSONVILLE—The directors of the Illinois Telephone Company have elected the following officers for the ensuing year: President, E. P. Kirby; vice-president, A. L. French; treasurer, E. S. Greenleaf; secretary-auditor, R. A. Gates; general manager, C. F. Tonn.

ARCOLA—The stockholders of the Arcola Grain, Coal and Telephone Company have elected the following directors for a term of Company have elected the following officers for the ensuing year: J. L. Portlock, Green Lee, T. T. Laughlin, W. J Francy, Frank Smith, J. E. Peterson, James T. Whiting.

INDIANA.

COLUMBIA CITY—The stockholders of the Whitley County Telephone Company have elected the following officers and directors for the ensuing year: President, S. J. Peabody; vice-president, J. E. Remington; secretary and treasurer, W. H. Magley; directors, S. J. Peabody, F. H. Foust, W. H. Magley, G. A. Pontius, Thomas R. Marshall, A. A. Adams, Walter McLallen of this city and James E. Remington, A. H. Krieg and Robert Wiener of South Whitley.

MARYLAND.

CUMBERLAND—At the annual meeting of the Western Maryland Telephone Company the following officers and directors were elected: President, James A. MacHenry; vice-president, D. R. Sloan; treasurer, Henry J. Glick; secretary, Carl C. Hetzel; general manager, George H. Randall; directors, B. A. Richmond, J. H. Holzshu, Clayton Purnell, H. H. Dickey, DeWarren H. Reynolds, D. P. Miller.

MICHIGAN.

MARSHALL.—The stockholders of the Marshall Telephone Company have elected the following directors: V. A. Lepper, L. C. Miller, E. B. Fisher, W. J. Stuart, C. E. Tarte, Charles F. Rood, E. B. Fisher is president; V. A. Lepper, vice-president; C. E. Tarte, secretary, and L. C. Miller, treasurer.

MISSOURI.

HANNIBAL—The Bluff City Telephone Company has elected the following officers: President, J. F. Davidson; vice-president, T. G. Dulaney; secretary and general manager, H. C. Conger; treasurer, J. P. Hinton.

MONTANA.

GREAT FALLS—The Cascade County Rural Telephone Company, recently incorporated, has elected the following officers and directors: President, Cuno Jaekel; vice-president, John Mainland; secretary, W. F. Kester; treasurer, E. B. Judd; directors, Duncan Cameron, John Mainland, C. F. Stork, E. B. Judd, Andrew Thisted.

NEBRASKA.

WAYNE—The stockholders of the Farmers' Independent Telephone Company have elected the following officers: President, Jay Wilson; secretary and treasurer, Chas. Long; board of management, Frank Long, Hans Brogreen, and Jim Jensen.

NEW YORK.

GLOVERSVILLE—At a recent meeting of the Glen Telephone Company the following officers were elected: President, P. F. Cole; vice-president, Stevens R. Jennings; secretary and treasurer, Delos Van Woert.

JAMESTOWN—The stockholders of the Home Telephone Company have elected the following directors for the ensuing year: Ralph C. Sheldon, Charles W. Herrick, W. J. Maddox, Brewer D. Phillips, S. B. Burchard and T. S. Lane, Jamestown; Julius Vautrot, Jr., George B. DeVoe, Charles B. Selby, Robert T. Izant, Calvin C. Clawson, Warren, Ohio.

JAMESTOWN—The stockholders of the Ashville and Panama Telephone Company have elected the following officers for the ensuing year: President, Geo. W. Appleby; vice-president, Brewer D. Phillips; secretary and treasurer, Alton H. Appleby; directors, George W. Appleby, Alton H. Appleby, James G. Howles, Watts Flatts; A. John Peterson, Brewer D. Phillips, Frank H. Mott, Jamestown; Sardius S. Lewis, Elmer Berry, Panama.

MONTICELLO—The Monticello Telephone Company has elected the following officers: President, G. L. McLaughlin; secretary, G. Van Wyck, W. M. Lovering, A. C. Shenstone, W. H. Harding, Jr., H. B. Haigh and John Englis, New York city.

HENNIKER—The Henniker Telephone Company, recently incorporated, has elected the followings officers: President, Geo. H. Sanborn; directors, C. B. Childs, Geo. H. Sanborn, D. E. Huntington, W. O. Folsom, L. W. French, Elwin T. Bacon.

NEW YORK CITY—The Alaska Telephone and Telegraph Company, which was recently incorporated here with a capital of $100,000, has elected the following directors: S. E. Boyd, Nome, Alaska; W. H. Duval, E. D. Church, J. H. Emanuel, Jr., P. V. R. L. Hatch; treasurer, H. F. Holmes.

DUNDEE—The stockholders of the Dundee, Tyrone and Bradford Telephone Company have elected the following directors for the ensuing year: Philander LaFever and Monroe Sutton, Dundee; Eugene Bigelow, Charles Losey, Altay; Charles Shaffer, D. Crawford, Alden Vanlieu, Tyrone; Captain Robinson and Dr. Stephen Switzer, Bradford.

SARATOGA SPRINGS—The Greenfield Telephone Company has elected the following officers for the coming year: President, William H. Harris; vice-president, John S. Jones; secretary, Benjamin S. Robinson; treasurer and general superintendent, Clarence E. Latham; directors, Charles E. Latham, Henry Menshousen, C. W. Spaulding.

OHIO.

BUCYRUS—The Bucyrus Telephone Company has elected the following officers for the ensuing year: President, Dr. John A. Chesney; vice-president, H. S. Blair; secretary and treasurer, J. C. F. Hull; directors. Dr. John A. Chesney, E. Blair, J. C. F. Hull, Benjamin Shearer, W. R. Miller, H. S. Blair, W. A. Blicke. Manager, Albert Unger.

BELLAIRE—The stockholders of the Ohio Valley Telephone Company have reorganized by electing W. T. Graham, of New York; J. B. Driggs, Hunter S. Armstrong, George Walters and Charles Rosser, as directors. Mr. Armstrong was elected president; Mr. Rosser, vice-president, and William Steas, secretary and treasurer.

CALDWELL—The Caldwell Independent Telephone Company has been reorganized with the following officers and directors: President and general manager, W. H. Bowron of Caldwell; vice-president, A. C. Davis; secretary and treasurer, Arthur Shafer; John Kaise, Marietta; A. C. Davis, Parkersburg; H. W. McKee, Cumberland; C. B. Berry, Marietta; Ralph Wooster, Warner; John Archer, A. S. Jones, Arthur Shafer, W. H. Bowron, Caldwell.

WEST MILTON—The West Milton Telephone Company has elected the following officers: President, Dr. W. H. Kessler; vice-president, Charles Ammon; treasurer, Havilah Coppick; secretary and general manager, C. E. Emerick.

VEEDER SWITCHBOARD COUNTERS

(STYLE 8)

Show rate of increase, so that exact calculations for the future may be made.

They likewise show how better to divide the work on the board among the operators.

Number of calls during each hour of the day can be shown. Interesting statistics are easily obtained by their use. Sockets fit in keyboard permanently. Counter can be inserted or removed at will.

Free Booklet describing 10 styles of Counters.

THE VEEDER MFG. CO.

No. 1 Sargeant St., HARTFORD, CONN.

Cyclometers, Odometers, Tachometers, Counters, and Fine Castings.

REVERSED "SOLID BACK" TRANSMITTER

GREATEST VOLUME
CLEARNESS, QUALITY

CENTRAL ENERGY and MAGNETO TELEPHONES

YOU CAN TALK BETTER by using our new Reversed "Solid Back" Transmitter. Its perfect tone and great intensity can only be appreciated by a trial.

YOU CAN HEAR BETTER with our Long Distance "Loud Speaking" Receiver with no exposed metal parts and permanent adjustment.

YOU CAN RING BETTER with our "Sampson" generator having imported steel magnets and Laminated Armature.

SEE OUR EXHIBIT, DECEMBER 13-14-15
ROOM 626, AUDITORIUM HOTEL, CHICAGO

The GEMMILL TELEPHONE & MFG. CO.
ORRVILLE, : : OHIO, U. S. A.

CABLE TERMINALS FOR CABLE CONSTRUCTION.

25 Pair Type B.

Hall Cable Boxes

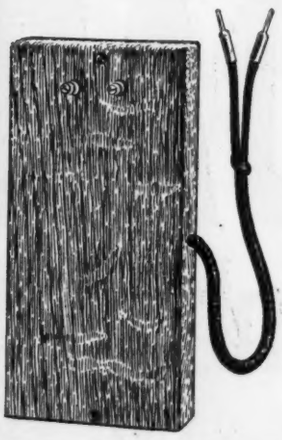
Neat, Substantial, Convenient, Designed for Underground and Aerial Installations, in all sizes; each pair provided with lightning protection.

Manufactured by

THE MOUNTAIN STATE ELECTRIC CO.

Correspondence Solicited. **WHEELING, W. VA.**

"Listening In"



Successful operation on Rural Telephone lines is greatly limited by the tendency of subscribers to leave the receiver off the hook or to "listening in."

ANDRAE

Telephone Condenser

enables "central" to ring up any party regardless of the position of the receivers on any other line. **Just what telephone companies need.** The Andrae Telephone Condenser saves time and trouble and unlike the many other devices on sale for this particular trouble, it allows the high frequency voice current to pass through readily but acts as an apparent high resistence to the low frequency currents. The simple construction of the Andrae Condenser obviates the necessity of an expert's service for its successful installation.

GUARANTEED.

Place 50 telephones on a line, remove 49 receivers and if you can ring through with receivers on you can ring through with receivers off. Write for our new No. 11 catalog.

Julius Andrae & Sons Co.
217 West Water St., Milwaukee, Wis.

WRITE TO ANDRAE

Please tell the Advertiser you saw his Announcement in TELEPHONY.

WESTERN

CEDAR POLES

IDAHO WASHINGTON MONTANA

The Lindsley Brothers Co.

SPOKANE, WASHINGTON

NOTICE. Dealers advertise Western Poles who never saw one. We are located in the West, our money invested, ready at all times to give your orders our personal attention. We are producers—not scalpers—and acknowledged pioneers and original shippers of Western Cedar Poles. Write us.

GENERAL OFFICE CHICAGO TRIBUNE BUILDING

"FROM FOREST TO CONSUMER."

CEDAR POLES

The Humbird Lumber Co., Ltd.

SAND POINT, IDAHO.

All Sizes Large Stock Low Prices

Prompt Shipments

LONG POLES A SPECIALTY.

WRITE FOR PRICES.

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CEDAR POLES

ALL SIZES FROM 16ft. to 70ft. for PROMPT SHIPMENT

We Own Large Tracts of Cedar Timber and Produce in Our Own Camps a Large Part of the Material we Handle.

WRITE FOR A COPY OF OUR TELEGRAPH CODE FOR CEDAR PRODUCTS.

C. H. WORCESTER CO.

Suite 1206, Tribune Building, Chicago, Ill., U. S. A.

ESTABLISHED IN 1867

WRIGHT BROS.

MARINETTE, WISCONSIN.

Wholesale and Retail Dealers in All Qualities and Kinds of

CEDAR

WE MAKE A SPECIALTY OF

POLES, POSTS AND TIES

WE WILL NOT BE UNDERSOLD

WRITE FOR DELIVERED PRICES

MAIN YARDS: Marinette, Wis., Amberg, Wis., Kelso, Mich., Lathrop, Mich., Beecher Lake, Wis., DeKuester's Sidings, Wis., [on Dunbar and Wausaukee R. R.,] Pembine, Wis.

Address all inquiries to WRIGHT BROS., MARINETTE, WISCONSIN.

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Hall L. Brooks Co.

Hayman Block, TOMAHAWK, WISCONSIN

DEALER IN

WHITE CEDAR POLES

POSTS AND PILING.

MIXED CAR LOTS A SPECIALTY

Write for Delivered Prices.

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PRINCIPAL YARDS { CHICAGO, ILL. / MENOMINEE, MICH. / CHEBOYGAN, MICH. / WEST SUPERIOR, WIS.

E. E. NAUGLE TIE CO.

159 LA SALLE STREET

POLES—THE BEST
SHIPMENT—PROMPT
PRICES—FAIR

CHICAGO, ILL.

WRITE FOR PRICES

MENTION TELEPHONY

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SAND POINT CEDAR COMPANY

SAND POINT, IDAHO

Producers of

LONG IDAHO CEDAR POLES

OUR MOTTO:
GOOD MATERIAL, PROMPT SHIPMENT.

WRITE FOR PRICES

White Cedar Poles

ALL LENGTHS AND SIZES

We are especially anxious to sell
5 in. 25 ft., 5 in. 30 ft.,
6 in. 25 ft., 6 in. 30 ft.

HOLT LUMBER COMPANY

STOCKS AT
Oconto, Wis., C. & N.-W. and C. M. & St. P.
Mountain, Wis., C. & N.-W.
Pound, Wis., C. M. & St. P.
Riddle Jct., Mich., C. M. & St. P.

OCONTO, WIS.

Chicago Office, 315 Dearborn St.

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Pittsburg & Lake Superior Iron Co.,

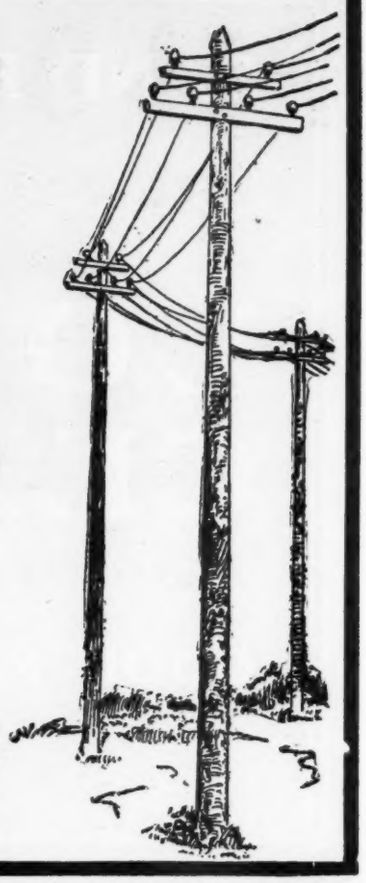
ESCANABA, MICHIGAN,

PRODUCERS AND WHOLESALERS

CEDAR POLES

FROM THE STUMP TO THE LINE.

WE ALWAYS CARRY A LARGE STOCK OF ALL SIZES OF WHITE CEDAR POLES, AND HAVING YARDS ON ALL PRINCIPAL RAILROADS IN NORTHERN MICHIGAN AND MINNESOTA, ARE IN POSITION TO MAKE IMMEDIATE SHIPMENT.



BELTRAMI CEDAR & LAND CO.

JOHN R. STEWART, Gen. Manager.

BLACKDUCK, - - MINNESOTA.

We offer to the trade a complete stock of White Cedar Posts and Poles from 10 to 60 ft. long. We take special care to make this stock equal to the best. We manufacture white cedar shingles and this enables us to use for shingles logs which others would ship to avoid loss. We call particular attention to our selected poles 21 ft. long, just the poles for rural lines, the extra foot making them equal to 25 ft. They are no loss as they can be used for 7 and 14 ft.

We invite correspondence and assure our old customers they will receive the same careful consideration as in the past, and to new trade we ask to ship you one car for your careful inspection and opinion.

We want to move 21 and 25 ft. Poles.

SPECIALTIES.

21 ft. Poles 4 to 6 inch.
25 ft. Telephone Poles.
6 1-2 in. 7 ft. Posts.
Short Poles 4 to 6 in. 10 to 20 ft.
Junction Poles.
7 1-2 in. 7 ft. Posts, 7 foot Posts.

The best assorted stock. The Straightest. Prompt Shipments. Mixed Car Lots.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

PENDLETON & GILKEY

816-817 Lumber Exchange Bldg.,
MINNEAPOLIS, MINN.

PRODUCERS OF EVERYTHING IN CEDAR.

CEDAR POLES

All Sizes Large Stock Low Prices
Prompt Shipments

YARDS

MOUNTAIN, WIS, ANDERSON, WIS. BREED, WIS.
JANESVILLE, WIS. SURING, WIS. LAKEWOOD, WIS.

KELLOGG SWITCHBOARD AND SUPPLY CO.

CHICAGO, ILL.

WHOLESALERS OF
MICHIGAN WHITE CEDAR

POLES
OF QUALITY

Five Yards Prompt Shipments

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FOWLER-JACOBS CO. ELMORE-FOWLER-JACOBS CO. JOHN H. FOWLER & CO.

TRADE MARK

THE FOWLER COMPANIES

WISCONSIN IDAHO MICHIGAN

POLES

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CEDAR POLES

FRANCIS BEIDLER & COMPANY

CHICAGO, ILL.

POLE YARDS:

MENOMINEE, MICH.
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SUPERIOR, WIS.
HERON, MONT.
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CEDAR TELEPHONE POLES

Thoroughly seasoned. Any length or size.
Immediate shipment. Seven distributing yards.
Forty years' experience.

WM. MUELLER COMPANY

Main Office, 1211-12-13 Marquette Bldg., CHICAGO.

CEDAR POLES

Large Stock; Best Quality; Prices Right
Write us before purchasing elsewhere

WITTENBERG CEDAR CO.

WITTENBERG, WISCONSIN

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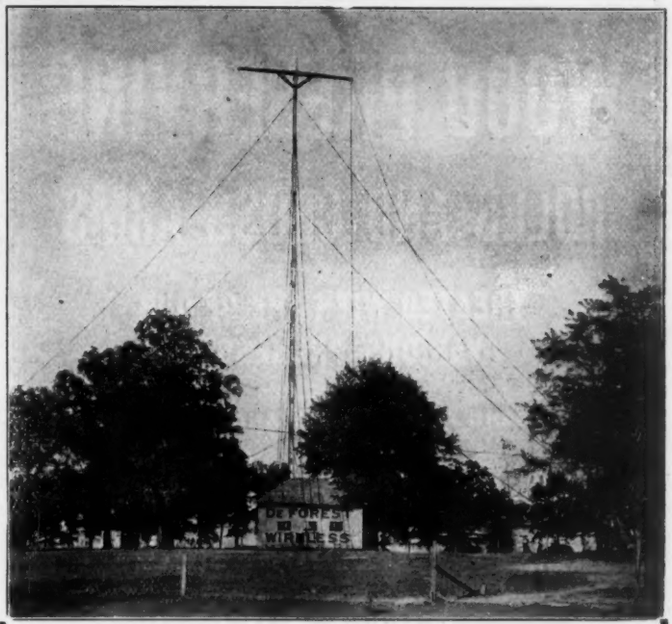


This 210 foot Mast at the World's Fair is anchored by

STOMBAUGH GUY ANCHORS

10 and 12 inch anchors were used

The following letter from Mr. H. E. Overstreet came as a result of the excellent showing of our anchor, and should prove interesting to those who have poles to guy.

OFFICE OF H. E. OVERSTREET,
General Contractor
414 Commercial Bldg.

St. Louis, Oct. 13, 1904.

W. N. MATTHEWS & BRO.,
505 Carleton Bldg., St. Louis.

Dear Sirs:—In May of this year I purchased from you 14 of your Stombaugh Guy Anchors, 8-12" and 6-10" for use in guying the American De Forrest Telegraph Co.'s Mast 210 feet high, which I erected in the grounds of the Louisiana Purchase Exposition Co. at St. Louis, Mo. I used eight of them, that is, one half the number necessary on that Mast—using the other eight of another manufacture—I have used the other six on my erection work in various places for guying gin poles, etc., putting them in and removing them to various places. They have given me entire satisfaction and I am enclosing you herewith an order for

90—8" Stombaugh Guy Anchors
90—10" Stombaugh Guy Anchors

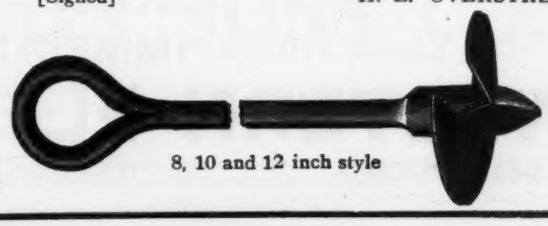
to be used in the erection of three masts at each of the four stations for the U. S. Navy, viz:

Key West, Fla,; Guantanamo, Cuba; San Juan, Porto Rico; Colon, Panama. Contract for which I secured last week.

With best wishes for mutual success, I am,

Yours very truly,

[Signed] H. E. OVERSTREET



8, 10 and 12 inch style

WOOD PRESERVING

POLES AND CROSS ARMS

TREATED WITH ANY OF OUR VARIOUS PROCESSES

SEND FOR BOOKLET AND PRICES

INTERNATIONAL CREOSOTING & CONSTRUCTION COMPANY

ADDRESS ALL COMMUNICATIONS TO

WORKS: Beaumont, Tex. / Texarkana, Tex. OFFICE: Galveston, Texas

Capacity Based on 24 Hours Treatment, 75,000,000 B. M. Feet Per Year.

Poles, Red Cedar, Cypress and Juniper

HOUSTON & LIGGETT,
LEWISBURG, TENN.

Yards: Missouri, Alabama, Mississippi and Texas.

POLES.

We make a Specialty of Michigan White Cedar.

Quality and Prompt Shipments are First Considerations.

Send in your orders. Sorting and Shipping Yards all through Michigan. Twenty-Five Years in the Pole Business.

W. C. STERLING & SON,
Main Office, MONROE, MICH.

BARRY & BENTON

PRODUCERS AND WHOLESALERS OF

Idaho Cedar Poles

1300-2-4 OLD COLONY BUILDING, CHICAGO.
Yards: Hope and Sand Point, Idaho.

POLES

ALL LENGTHS—ALL SIZES

LARGE STOCKS—**IMMEDIATE SHIPMENT**—WRITE FOR PRICES

WESTERN ELECTRIC COMPANY

CHICAGO AND OTHER LEADING CITIES NEW YORK

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And want advertisements not exceeding twenty words exclusive of address, will be inserted in these columns for $1.00 each It over twenty words the rate will be 5 cents per word.

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FOR SALE—One new Express type, 50 line capacity switchboard. As this board is slightly shopworn through use while on exhibit at the World's Fair, it is offered at a liberal discount for cash sale. Board guaranteed in every respect. Address the Wesco Supply Co., St. Louis, Mo.

WANTED—Position as superintendent, manager or wire chief. Eight years' experience. Graduate of International Correspondence Schools. Experience in all branches of telephone work. Good reference. Address, 279, care TELEPHONY.

WANTED—No. 2 and No. 21 second-hand Western Electric bells. Address, 274, care of TELEPHONY.

HAVE OPTION for purchase of wholesale electrical supply house in Indianapolis. Established, profitable trade, average business $100,000 per year. Only one competing house in Indiana. Want practical man with capital to join in purchase. W. A. ROYSE, electrical contractor, 16 E. Market street, Indianapolis, Ind.

WANTED—Man and wife to take complete charge of two exchanges in South Dakota. References required. Good opportunity for right parties. Address 278, care of TELEPHONY.

MEN WANTED—Telephone superintendents, contract inspectors and installers can hear of good propositions that will add to their income. The Benbow Company, 14 South Broad street, Philadelphia.

FOR SALE—Independent magneto plant in southern town, 3,500 population; 250-drop switchboard; 150 drops in operation; gross annual income, $3,500; fixed expenses, $1,300. In operation five years. No competition. Town and plant growing fast. Price, $10,000. Address, 277, care of TELEPHONY.

FOR SALE—A telephone system operating in eight counties in a western state, with five small exchanges, good Independent connections in the large cities nearby. Poor health the cause. Will make easy terms. Address, 268, care TELEPHONY.

THE SKELLEYPHONE

An Extension Arm Telephone adaptable to any circuit.

Universal adjustment any desired extension.

For wall, roll or flat top desk.

Pleases subscriber and Stockholder.

SKELLEY MANUFACTURING COMPANY, 50 High St., CLEVELAND, O.

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DOUBLE GALVANIZED TELEGRAPH WIRE

STEEL B.B E.B.B.

HARD DRAWN COPPER WIRE

GALVANIZED WIRE STRAND FOR POLE GUYS AND CABLE SUPPORT

MADE BY

JOHN A. ROEBLING'S SONS CO.

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Branch Offices and Warehouses: NEW YORK CHICAGO CLEVELAND SAN FRANCISCO

Bituminized Fibre Conduit

For Underground Construction

Combines the **good features** of other conduits.
Eliminates the **bad features** existing in many kinds.
Has valuable features not found in any other ducts.
Made in 7-foot lengths with male and female joints, making construction very rapid and simple, with consequent low cost.
Alignment is perfect and permanent without tedious care and skill required in laying of butt-joint conduits.
Users are astonished by the ease and rapidity with which cables can be drawn in and this without the slightest scratching or injury to the lead covering thereof.
Made in sizes from 1-inch to 10-inch diameter.
Bends of any radius and any angle.
Write us for further information and prices, stating sizes and quantities required.

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See Our World's Fair Exhibit
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Other Offices:
170 Broadway, New York
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THE INVESTMENT IS A-1

Most questions are debatable, but the one,

"Resolved, that it pays to liberally install TELEPHONE BOOTHS,"

so far as we know, has no negative supporter.

If you refuse to argue the question, then give in and place your orders.

YESBERA MFG. CO., Toledo, O.

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ENGRAVERS BY ALL PROCESSES

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358 DEARBORN ST. CHICAGO.

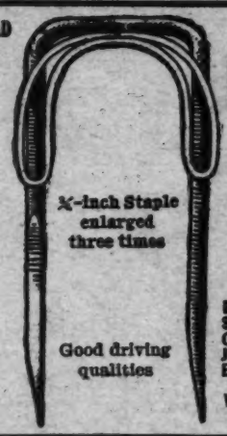
SHEET BRASS
ALL TEMPERS
BRASS DRILL ROD
German Silver, Brass and Copper **WIRE**
BRAZED and SEAMLESS TUBING

The Plume & Atwood Mfg. Co.
199 Lake Street, CHICAGO

Scovill Mfg. Co.
210 Lake St,. CHICAGO

Sheet Brass of all tempers
Brass Rod, Wire and Tubing
Special Spring German Silver for telephone work

Estimates given on Telephone Parts or Special Articles of Brass, Copper, German Silver or Aluminum

SQUARE HEAD
Double fibre insulation
Securely attached

¾-inch Staple enlarged three times
Good driving qualities
PAT. NOV. 27, 1900.

Manufactured and For Sale by
Blake Signal & Mfg. Co.
246 Summer Street,
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SELLING AGENTS:
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BROOKS-FOLLIS ELEC. CORPORATION, San Francisco.
WESTERN ELEC. CO.

NORWAY IRON
Cold Rolled Flats
Cold Drawn Flats and Rounds
Magnet Steel
GEO. NASH & CO.

When You Think of
DRY BATTERIES
Remember the
"1900"
It Does the Work

Send a Trial Order to the Nearest Dealer, or Telephone Manufacturer.

Nungesser Electric Battery Co.
CLEVELAND
General Sales Office: 128 W. Jackson Blvd., Chicago

It Pays to Test
Your lines periodically for insulation and resistance.

This can be best done with a Volt Ammeter. Mine are especially designed for telephone men. Their price is low too.

Write me and I'll tell you more about my goods.

Louis M. Pignolet
82 Cortlandt St., N. Y.

AMERICAN ELECTRIC TELEPHONE CO.

CHICAGO

AUTHORIZED CAPITAL THREE MILLION.

LARGEST MANUFACTURERS IN THE WORLD.

WRITE FOR CATALOGUES.

AMERICAN ELECTRICAL WORKS

OUR SPECIALTIES,

TELEPHONE WIRES AND CABLES

CHICAGO, 82 Lake St. PHILLIPSDALE, R. I. NEW YORK, 26 Cortlandt.

TELEPHONE MATERIAL

Get OUR proposition before buying

We Can Save You Money.

Frow, Conover & Co.

Purchasing and Forwarding Agent for INDEPENDENT Telephone Companies.

Suite 1112, 135 ADAMS STREET, CHICAGO, ILL.

W. H. CRUMB & COMPANY

ENGINEERS—CONTRACTORS

Telephone Engineering and Construction

Meritorious Independent Telephone Enterprises Financed

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Consulting & Contracting Telephone Engineer

Kansas, Oklahoma and Indian Territory.

Plans and Estimates for Old and New Plants

Wellington, Kans.

Old Systems overhauled and placed on paying basis

J. F. BUTTERFIELD,

Electrical Engineer and Contractor

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